Unit 1: Information Technology Basics

Students should have basic proficiency in the competencies outlined in this unit prior to entry into a program focusing on Information Support and Services, Network Systems, Programming and Software Development, and Interactive Media.

Content Standard 1.1: Students demonstrate basic knowledge of information technology history

BIL: **Essential –** ISS, NS, PSD, IM
RC:

EDU:	**10**	**12**	**AD**
ISS		P	
NS		P	
PSD		P	
IM	I	P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.1.1 Identify significant advances in the development of computer hardware and software					ISS, NS, PSD, IM
1.1.2 Identify major milestones in the development of information technology					ISS, NS, PSD, IM
1.1.3 Identify major individuals and their contributions to the information technology field					ISS, NS, PSD, IM
1.1.4 Discuss the speed with which computer technology has evolved (i.e., evolution time line)					ISS, NS, PSD, IM

Content Standard 1.2: Students demonstrate knowledge of the impact of information technology on society

BIL: **Essential –** ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		P	
NS	I	P	PR
PSD	I	IR	P
IM	I	P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.2.1 Identify how information technology impacts people and is used in business/industry/government and other institutions					NS, PSD, IM
1.2.2 Identify the impact of information technology on career pathways in business/industry (e.g. how computers have eliminated and created jobs)					NS, PSD, IM
1.2.3 Demonstrate knowledge of the psychological and health risks associated with computers (e.g., web addiction, carpal tunnel, gaming)					NS, PSD, IM
1.2.4 Demonstrate knowledge of security risks posed by the use of information technology and associated safeguards		✓		✓	ISS, PSD
1.2.5 Identify possible effects of natural disasters on computers					NS, PSD, IM
1.2.6 Discuss the evolution of international telecommunications standards and trends				✓	NS, PSD
1.2.7 Demonstrate knowledge of the impact of computers on access to information and information exchange worldwide				✓	NS, PSD
1.2.8 Identify issues and trends affecting computers and information privacy		✓		✓	ISS, PSD
1.2.9 Demonstrate ethical practices as they relate to information technology		✓		✓	ISS, PSD

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.2.10 Explain how information technology affects the natural environment (e.g. disposal of equipment, energy use, use of natural resources)					ISS, NS, PSD, IM
1.2.11 Discuss how IT innovation has impacted society and corporate efficiency (e.g., RFID, eServices)			✓		NS
1.2.12 Discuss legislation that relates to information security (e.g., Gramm-Leach-Bliley Sarbanes-Oxley, Patriot Act, DMCA, HIPAA, etc.)		✓	✓		

Content Standard 1.3: Students demonstrate knowledge of information technology basics

BIL: Essential – ISS, NS, PSD, IM
RC: A+

EDU:	10	12	AD
ISS	I	P	
NS		P	
PSD	I	P	
IM		P	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.3.1 Identify classifications of computing platforms					ISS, NS, PSD, IM
1.3.2 Identify the elements of the information processing cycle (i.e., input, process, output, and storage)					ISS, NS, PSD, IM
1.3.3 Identify major hardware components and their functions					ISS, NS, PSD, IM
1.3.4 Identify types of computer storage devices					ISS, NS, PSD, IM
1.3.5 Identify types of processing (e.g., batch, interactive, event-driven)			✓		NS, IM
1.3.6 Identify major operating system fundamentals and components	✓		✓		NS, IM
1.3.7 Identify the role of binary and hexadecimal systems in information technology		✓	✓		IM
1.3.8 Explain the role of number systems and internal data representation in information technology			✓		NS, IM
1.3.9 Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts, Internet/Intranet resources)		✓			ISS, PSD, IM
1.3.10 Discuss the need for asset management (e.g., hardware, software licensing)			✓		NS
1.3.11 Explain the difference between asset tracking and asset management			✓		NS

Content Standard 1.4: Students demonstrate knowledge of the classes of software associated with information technology

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		P	
NS	I	P	
PSD	I	P	
IM	I	IR	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.4.1 Describe key functions of systems software					ISS, NS, PSD, IM
1.4.2 Classify widely used software applications (e.g., word processing, database management, spreadsheet development)					ISS, NS, PSD, IM

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.4.3 Describe the range of languages used in software development			✓	✓	ISS
1.4.4 Explain relationship between data and software development (e.g., basic data structures, XML, relational databases)			✓	✓	ISS, NS
1.4.5 Identify new and emerging types of software					ISS, NS, PSD, IM
1.4.6 Explain intellectual property (e.g., software, images, open-source, documentation)			✓		NS
1.4.7 Explain the historical difference between packaged software and custom/in house developed software			✓		NS

Content Standard 1.5: Evaluate career opportunities in information technology

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	I	IR	
NS	I	P	
PSD	I	IR	P
IM	I	P	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.5.1 Identify entry-level positions			✓		ISS, NS, IM
1.5.2 Identify possible career pathways within Indiana, the United States and globally			✓		ISS, NS, IM
1.5.3 Compare the types of positions included in Information Support and Services, Network Systems, Programming and Software Development, and Interactive Media (e.g., compensation, benefits, travel, quality of life, etc.)			✓		NS, IM
1.5.4 Identify types of administration/management positions available and the nature of each			✓		ISS, NS, IM
1.5.5 Research job opportunities			✓		ISS, NS, IM
1.5.6 Compile occupational profile			✓		ISS, NS, IM
1.5.7 Identify certification issues within a particular career path	✓		✓		NS, IM
1.5.8 Identify factors influencing employment opportunities (e.g. outsourcing, offshore)			✓		NS
1.5.9 Identify education and training requirements for selected career pathway			✓		ISS, NS, IM
1.5.10 Design a career path for a personal career in information technology (i.e., personal goal-setting)			✓		ISS, NS, IM
1.5.11 Design a time line for personal career advancement in the information technology field			✓		NS, IM
1.5.12 Identify professional organizations and the benefits derived from memberships in professional organizations in the area of information technology			✓		ISS, NS, IM
1.5.13 Identify alternative resources related to career development (e.g. trade journals, usergroups, newsgroups, etc.)			✓		NS
1.5.14 Discuss the occupational trends historically and in the future			✓		NS
1.5.15 Participate in job shadowing/internships by interest	✓	✓	✓	✓	

Content Standard 1.6: Students explore the future of information technologies

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	I	IR	
NS	I	P	
PSD	I	IR	P
IM	I	IR	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.6.1 Identify new technologies relevant to information technology	✓	✓	✓		IM
1.6.2 Discuss the future impact of information technology on business operations (i.e. productivity, global competitiveness)			✓		NS
1.6.3 Examine the importance of new technologies to future developments and to the future knowledge of worker productivity			✓		ISS, IM
1.6.4 Identify new and emerging drivers and inhibitors of information technology change			✓		ISS, NS, IM

Content Standard 1.7: Students create documents using word processing software

BIL: Essential – ISS, NS, PSD, IM
RC: MOUS

EDU:	10	12	AD
ISS	I	P	
NS	I	P	
PSD	I	P	
IM	I	P	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.7.1 Demonstrate proficiency in keyboarding skills					ISS, NS, PSD, IM
1.7.2 Retrieve existing documents					ISS, NS, PSD, IM
1.7.3 Create documents (e.g., letters, memos, reports) using existing forms and templates					ISS, NS, PSD, IM
1.7.4 Safeguard documents using name and save functions					ISS, NS, PSD, IM
1.7.5 Format text using basic formatting functions (e.g., page setup, tabs, bullets, page numbers, font enhancements, cut and paste)					ISS, NS, PSD, IM
1.7.6 Check documents using print preview functions					ISS, NS, PSD, IM
1.7.7 Locate/replace text using search and replace functions					ISS, NS, PSD, IM
1.7.8 Create new word processing forms, style sheets, and templates					ISS, NS, PSD, IM
1.7.9 Employ word processing utility tools (e.g., spell checker, grammar checker, thesaurus)					ISS, NS, PSD, IM
1.7.10 Create tables using table functions (e.g., setup, formatting, editing)					ISS, NS, PSD, IM
1.7.11 Create columns using column functions (e.g., setup, formatting, editing)					ISS, NS, PSD, IM
1.7.12 Create outlines					ISS, NS, PSD, IM
1.7.13 Create footnotes and endnotes					ISS, NS, PSD, IM
1.7.14 Create and run macros					ISS, NS, PSD, IM
1.7.15 Assemble documents using merge functions (e.g., merge address files with letters and envelopes)					ISS, NS, PSD, IM
1.7.16 Format text using advanced formatting features (e.g., headers/footers/dropped caps, indexing)					ISS, NS, PSD, IM
1.7.17 Print materials using print functions (e.g., number of copies, duplexing or one-sided, selected pages or whole document)					ISS, NS, PSD, IM
1.7.18 Proofread and edit documents					ISS, NS, PSD, IM
1.7.19 Access needed information using word processing help screens					ISS, NS, PSD, IM
1.7.20 Input data using speech recognition technology					ISS, NS, PSD, IM

Content Standard 1.8: Students create relational databases

BIL: Essential – ISS, NS, PSD, IM
RC: MOUS

EDU:	10	12	AD
ISS		P	
NS		P	
PSD		P	
IM	I	P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.8.1 Design a simple database in accordance with written and/or oral specifications					ISS, NS, PSD, IM
1.8.2 Create and edit database table					ISS, NS, PSD, IM
1.8.3 Edit the content of a database table (e.g., add, delete, and modify records)					ISS, NS, PSD, IM
1.8.4 Search a table to locate records					ISS, NS, PSD, IM
1.8.5 Sort data using single or multiple fields					ISS, NS, PSD, IM
1.8.6 Enter data using a form					ISS, NS, PSD, IM
1.8.7 Create/modify a form design					ISS, NS, PSD, IM
1.8.8 Perform single- and multiple-table queries (e.g., create, run, save)					ISS, NS, PSD, IM
1.8.9 Create calculated fields					ISS, NS, PSD, IM
1.8.10 Generate customized reports for database files					ISS, NS, PSD, IM
1.8.11 Process data using database features (e.g., structure, format, attributes, relationships, and keys)					ISS, NS, PSD, IM
1.8.12 Locate/replace data using search and replace functions					ISS, NS, PSD, IM
1.8.13 Print forms, reports, and results of queries					ISS, NS, PSD, IM
1.8.14 Verify accuracy of output					ISS, NS, PSD, IM
1.8.15 Add/remove filters					ISS, NS, PSD, IM
1.8.16 Create multiple criteria expressions					ISS, NS, PSD, IM
1.8.17 Create adjoined files					ISS, NS, PSD, IM
1.8.18 Index files					ISS, NS, PSD, IM
1.8.19 Create subforms					ISS, NS, PSD, IM
1.8.20 Group data in reports					ISS, NS, PSD, IM
1.8.21 Create graphs					ISS, NS, PSD, IM
1.8.22 Alter the appearance of a form by adding objects or properties					ISS, NS, PSD, IM
1.8.23 Identify the relationship between database components					ISS, NS, PSD, IM
1.8.24 Design a database to meet the needs of an actual situation or business problem					ISS, NS, PSD, IM
1.8.25 Evaluate database design and functionality					ISS, NS, PSD, IM

Content Standard 1.9: Students create spreadsheets

BIL: Essential – ISS, NS, PSD, IM
RC: MOUS

EDU:	10	12	AD
ISS		P	
NS		P	
PSD		P	
IM	I	P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.9.1 Design and create a spreadsheet in accordance with written and/or oral specifications					ISS, NS, PSD, IM
1.9.2 Retrieve existing spreadsheets					ISS, NS, PSD, IM

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.9.3 Check spreadsheets using print preview functions					ISS, NS, PSD, IM
1.9.4 Format spreadsheets using basic formatting features (e.g., page setup)					ISS, NS, PSD, IM
1.9.5 Perform calculations using simple formulas					ISS, NS, PSD, IM
1.9.6 Edit spreadsheets					ISS, NS, PSD, IM
1.9.7 Create charts and graphs from spreadsheets					ISS, NS, PSD, IM
1.9.8 Group worksheets					ISS, NS, PSD, IM
1.9.9 Delete within spreadsheets					ISS, NS, PSD, IM
1.9.10 Move/copy within spreadsheets					ISS, NS, PSD, IM
1.9.11 Input/process data using spreadsheet functions					ISS, NS, PSD, IM
1.9.12 Improve spreadsheet display using enhancement features					ISS, NS, PSD, IM
1.9.13 Protect data using spreadsheet protection features					ISS, NS, PSD, IM
1.9.14 Record and run macros					ISS, NS, PSD, IM
1.9.15 Troubleshoot spreadsheet problems					ISS, NS, PSD, IM
1.9.16 Resolve function errors as needed					ISS, NS, PSD, IM
1.9.17 Apply advanced spreadsheet formulas					ISS, NS, PSD, IM
1.9.18 Create spreadsheet solutions to business problems					ISS, NS, PSD, IM
1.9.19 Make "*what if*—" business decisions using spreadsheets as a tool					ISS, NS, PSD, IM
1.9.20 Save spreadsheets					ISS, NS, PSD, IM
1.9.21 Access needed information using online help features					ISS, NS, PSD, IM
1.9.22 Print spreadsheets					ISS, NS, PSD, IM

Content Standard 1.10: Students perform desktop publishing functions

BIL: Essential – ISS, NS, PSD, IM
RC: MOUS

EDU:	10	12	AD
ISS		P	
NS	I	P	
PSD	I	P	
IM	I	P	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.10.1 Prepare publications using desktop publishing software					ISS, NS, PSD, IM
1.10.2 Format new desktop publishing files					ISS, NS, PSD, IM
1.10.3 Enter information directly into document					ISS, NS, PSD, IM
1.10.4 Place preformatted text into document					ISS, NS, PSD, IM
1.10.5 Place graphics in document					ISS, NS, PSD, IM
1.10.6 Employ draw boxes					ISS, NS, PSD, IM
1.10.7 Create graphics files using clip art					ISS, NS, PSD, IM
1.10.8 Import scanned files					ISS, NS, PSD, IM
1.10.9 Enhance publications using different fonts, styles, attributes, justification, etc.					ISS, NS, PSD, IM
1.10.10 Enhance publications using paint/draw functions					ISS, NS, PSD, IM
1.10.11 Create two-sided documents					ISS, NS, PSD, IM
1.10.12 Perform editing functions					ISS, NS, PSD, IM
1.10.13 Set up master pages					ISS, NS, PSD, IM
1.10.14 Output desktop publishing files					ISS, NS, PSD, IM

Content Standard 1.11: Students create presentations using presentation graphics software

BIL: **Essential –** ISS, NS, PSD, IM
RC: **MOUS**

EDU:	10	12	AD
ISS		P	
NS		P	
PSD		P	
IM	I	P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.11.1 Identify hardware items that support presentation software (e.g., scanners, digital cameras, printers, and projection systems)					ISS, NS, PSD, IM
1.11.2 Compare/contrast various presentation software packages					ISS, NS, PSD, IM
1.11.3 Create computer presentation and handouts in accordance with basic principles of graphics design and visual communication					ISS, NS, PSD, IM
1.11.4 Edit presentations					ISS, NS, PSD, IM
1.11.5 Copy from one presentation to another					ISS, NS, PSD, IM
1.11.6 Print a single slide, an entire presentation, an outline, and notes					ISS, NS, PSD, IM
1.11.7 Insert clip art in a slide					ISS, NS, PSD, IM
1.11.8 Create and insert word art objects					ISS, NS, PSD, IM
1.11.9 Create/modify a graph on a slide					ISS, NS, PSD, IM
1.11.10 Add a template to a presentation					ISS, NS, PSD, IM
1.11.11 Remove a template from a presentation					ISS, NS, PSD, IM
1.11.12 Create graphics documents using drawing and painting software programs					ISS, NS, PSD, IM
1.11.13 Add transitions to slide shows					ISS, NS, PSD, IM
1.11.14 Run slide shows manually and automatically					ISS, NS, PSD, IM
1.11.15 Save slide show presentations					ISS, NS, PSD, IM

Content Standard 1.12: Students integrate data from various software applications

BIL: **Essential –** ISS, NS, PSD, IM
RC: **MOUS**

EDU:	10	12	AD
ISS		P	
NS			
PSD		P	
IM	I	P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.12.1 Analyze problems requiring solutions involving the integration of computer applications					ISS, NS, PSD, IM
1.12.2 Select appropriate productivity tool for solving specific problem					ISS, NS, PSD, IM
1.12.3 Select *source* application and *destination* application					ISS, NS,PSD, IM
1.12.4 Move/copy information between integrated applications					ISS, NS, PSD, IM
1.12.5 Link objects between applications					ISS, NS, PSD, IM
1.12.6 Embed information in applications					ISS, NS, PSD, IM

Content Standard 1.13: Students demonstrate knowledge of basic data communications components and trends

BIL: Essential – ISS, NS, IM, PSD
RC:

EDU:	10	12	AD
ISS		P	
NS		P	
PSD		IR	P
IM		IR	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.13.1 Identify key communications procedures	✓	✓			PSD, IM
1.13.2 Identify the hardware associated with telecommunications functions		✓			
1.13.3 Differentiate the uses of data communication equipment	✓	✓			PSD, IM
1.13.4 Identify types of communications media	✓	✓			PSD, IM
1.13.5 Identify data transmission codes and protocols	✓	✓			IM
1.13.6 Differentiate between local area networks, and wide-area networks, and other networks	✓	✓	✓		IM
1.13.7 Discuss data communication trends	✓	✓			IM
1.13.8 Discuss major current issues in data communications	✓	✓			IM
1.13.9 Analyze security issues	✓	✓			IM

Content Standard 1.14: Students access information using electronic sources

BIL: Essential – ISS, NS, IM**,** PSD
RC:

EDU:	10	12	AD
ISS		P	
NS		P	
PSD		P	
IM		P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.14.1 Explain how to conduct searches using electronic sources (e.g., selection of search terms)					ISS, NS, PSD, IM
1.14.2 Access information using telecommunications software					ISS, NS, PSD, IM
1.14.3 Access information using teleconferencing/video conferencing techniques		✓			ISS, PSD, IM
1.14.4 Access information using portable or virtual storage technology					ISS, NS, PSD, IM
1.14.5 List the uses of simulation/modeling as an information source				✓	ISS, PSD, NS
1.14.6 Evaluate the quality and usability of electronic information					ISS, NS, PSD, IM
1.14.7 Download information					ISS, NS, PSD, IM

Content Standard 1.15: Students demonstrate proficiency with electronic mail

BIL: Essential – ISS, NS, IM**,**PSD
RC:

EDU:	10	12	AD
ISS	P		
NS	P		
PSD	P		
IM	P		

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.15.1 Explain the basic purposes of e-mail systems					ISS, NS, PSD, IM
1.15.2 Identify basic e-mail features and options					ISS, NS, PSD, IM
1.15.3 Discuss security issues and guidelines for legal usage of e-mail					ISS, NS, PSD, IM
1.15.4 Identify contamination protection strategies for e-mail (e.g., spam)					ISS, NS, PSD, IM
1.15.5 Identify available e-mail systems and the characteristics/features of each					ISS, NS, PSD, IM
1.15.6 Access e-mail system using login and password functions					ISS, NS, PSD, IM
1.15.7 Access e-mail messages received					ISS, NS, PSD, IM
1.15.8 Access e-mail attachments					ISS, NS, PSD, IM
1.15.9 Demonstrate e-mail etiquette					ISS, NS, PSD, IM
1.15.10 Create e-mail messages in accordance with established business standards (e.g., grammar, word usage, spelling, sentence structure, clarity, e-mail etiquette)					ISS, NS, PSD, IM
1.15.11 Send e-mail messages					ISS, NS, PSD, IM
1.15.12 Assign priority levels to messages					ISS, NS, PSD, IM
1.15.13 Create distribution lists					ISS, NS, PSD, IM
1.15.14 Employ e-mail options such as "reply requested" and "out-of-office reply"					ISS, NS, PSD, IM
1.15.15 Reply to and forward e-mail messages					ISS, NS, PSD, IM
1.15.16 Attach documents to messages					ISS, NS, PSD, IM
1.15.17 Create folders for organizing messages and documents					ISS, NS, PSD, IM

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.15.18 Save, print, and delete e-mail messages/attachments					ISS, NS, PSD, IM
1.15.19 Access needed information using e-mail help facilities and tools					ISS, NS, PSD, IM
1.15.20 Discuss governance and acceptable use policy regarding email					NS

Content Standard 1.16: Students install/configure software programs

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		P	
NS	I	P	
PSD	I	IR	P
IM		I	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.16.1 Identify hardware requirements (e.g., processor, memory, disk space, communications, printers, monitors)	✓				NS, IM
1.16.2 Determine compatibility of hardware and software	✓				NS, IM
1.16.3 Install given application/system software on various platforms in accordance with manufacturer's and business procedures	✓				NS, IM
1.16.4 Access needed help using manufacturers' technical support resources	✓				NS, IM
1.16.5 Disable/uninstall software that may interfere with installation of new software	✓				NS, IM
1.16.6 Verify compliance to licensing agreement	✓				NS, IM
1.16.7 Differentiate between procedures for an upgrade and for a new installation	✓				NS, IM
1.16.8 Differentiate between stand-alone and network installation procedures	✓				NS, IM
1.16.9 Select appropriate installation options (e.g., default, customized)	✓				NS, IM
1.16.10 Configure software to appropriate operating system settings	✓				NS, IM
1.16.11 Troubleshoot unexpected results	✓				NS, IM
1.16.12 Document step-by-step installation and configuration procedures	✓				NS, IM
1.16.13 Verify software installation and operation	✓				NS, IM
1.16.14 Convert data files if required	✓				NS, IM
1.16.15 Configure macros, tools, and packages to accomplish simple organizational and personal tasks	✓				NS, IM
1.16.16 Demonstrate back-up, recovery, and restoration techniques					NS

Content Standard 1.17: Students demonstrate basic knowledge of the Internet

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	P		
NS	P		
PSD	P		
IM	P		

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.17.1 Identify the key characteristics of the Internet (e.g. structure of the URL)					ISS, NS, PSD, IM
1.17.2 Discuss the ownership/administration of the Internet					ISS, NS, PSD, IM
1.17.3 Trace the development of Internet technology					ISS, NS, PSD, IM
1.17.4 Identify current issues related to the Internet					ISS, NS, PSD, IM
1.17.5 Identify services and tools offered on the Internet					ISS, NS, PSD, IM
1.17.6 Identify the specific strengths, weaknesses, and special features of available search engines					ISS, NS, PSD, IM
1.17.7 Utilize accepted Internet etiquette (i.e., netiquette)					ISS, NS, PSD, IM
1.17.8 Identify current uses and applications of the Internet					ISS, NS, PSD, IMISS, NS PSD IM

Content Standard 1.18: Students access the Internet

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	P	PR	
NS	P	PR	
PSD	P	PR	
IM	P	PR	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.18.1 Connect to the Internet					ISS, NS, PSD, IM
1.18.2 Test Internet connection					ISS, NS, PSD, IM
1.18.3 Identify components of Internet software					ISS, NS, PSD, IM
1.18.4 Install Internet software					ISS, NS, PSD, IM
1.18.5 Explore browser features					ISS, NS, PSD, IM
1.18.6 Download software upgrades from the Internet					ISS, NS, PSD, IM
1.18.7 Unpack files using compression software					ISS, NS, PSD, IM
1.18.8 Demonstrate acute awareness of virus protection techniques					ISS, NS, PSD, IM
1.18.9 Install/update firewalls and malware protection		✓			
1.18.10 Use mobile devices to access the Internet					NS

Content Standard 1.19: Students utilize Internet services

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	P	PR	
NS	P	PR	
PSD	P	PR	
IM	P	PR	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.19.1 Access business and technical information using the Internet					ISS, NS, PSD, IM
1.19.2 Select search engine(s) and use appropriate search procedures to locate information					ISS, NS, PSD, IM
1.19.3 Navigate web sites using software functions (e.g., forward, back, go to, bookmarks)					ISS, NS, PSD, IM
1.19.4 Evaluate Internet resources (e.g., accuracy of information)		✓			ISS, PSD, IM
1.19.5 Access library catalogs on the Internet					ISS, NS, PSD, IM
1.19.6 Access commercial, government, and education resources					ISS, NS, PSD, IM
1.19.7 Bookmark web addresses (URLs)					ISS, NS, PSD, IM
1.19.8 Download files from FTP archives					ISS, NS, PSD, IM
1.19.9 Communicate via e-mail using the Internet					ISS, NS, PSD, IM
1.19.10 Subscribe to mailing lists					ISS, NS, PSD, IM

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.19.11 Recognize the value of special interest group forums (e.g., blogs)					ISS, NS, PSD, IM
1.19.12 Retrieve online tools					ISS, NS, PSD, IM
1.19.13 Download/convert Internet programming files					ISS, NS, PSD, IM
1.19.14 Install/configure web browser					ISS, NS, PSD, IM
1.19.15 Apply multimedia capabilities of the World Wide Web					ISS, NS, PSD, IM
1.19.16 Evaluate plug-ins and helpers to the web browser					ISS, NS, PSD, IM
1.19.17 Explore collaboration tools					ISS, NS, PSD, IM
1.19.18 Participate in online audio and video conferencing					ISS, NS, PSD, IM
1.19.19 Archive files					ISS, NS, PSD, IM
1.19.20 Compile a collection of business sites (e.g., finance and investment)					ISS, NS, PSD, IM
1.19.21 Explore electronic commerce					ISS, NS, PSD, IM

Content Standard 1.20: Students demonstrate knowledge of web page basics

BIL: **Essential** – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		P	
NS		I	
PSD	I	IR	P
IM	I	IR	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
1.20.1 Differentiate between a client and a server				✓	ISS, NS, PSD
1.20.2 Explain the role of browsers in reading files on the World Wide Web (e.g., text-only, hypertext)				✓	ISS, NS, PSD
1.20.3 Identify how different browsers affect the look of a web page				✓	ISS, NS, PSD
1.20.4 Compare/contrast the features and functions of software editors available for designing web pages				✓	ISS, NS, PSD
1.20.5 Explain how bandwidths affect data transmission and on-screen image				✓	ISS, NS, PSD
1.20.6 Discuss the characteristics and uses of plug-ins				✓	ISS, NS, PSD
1.20.7 Compare the advantages and disadvantages of running your own server vs. using a server provider					ISS, NS, PSD

Content Standard 1.21: Students install computer system (e.g., monitor, keyboard, disk drive, and printer)

BIL: Essential – ISS, NS**,** PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS	I	P	
PSD		I	P
IM			

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
1.21.1 Identify primary PC components and the functions of each	✓				NS, PSD
1.21.2 Demonstrate knowledge of how hardware components interact and how conflicts arise	✓				NS, PSD
1.21.3 Access needed information using manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts)	✓				NS
1.21.4 Secure supplies and resources	✓				NS
1.21.5 Respond to error messages and symptoms of hardware failures	✓				NS
1.21.6 Install boards to support peripherals	✓				NS
1.21.7 Connect peripherals to CPU	✓				NS
1.21.8 Employ appropriate safety precautions when working with PCs	✓				NS
1.21.9 Configure system	✓				NS
1.21.10 Verify system operation	✓				NS
1.21.11 Document system installation activities	✓				NS
1.21.12 Backup system configuration	✓				NS
1.21.13 Test all applications	✓				NS

Unit 2: Operating Systems

Content Standard 2.1: Students evaluate operating systems

BIL: Essential – ISS, NS, IM **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS		P	R
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
2.1.1 Compare and contrast operating systems					NS
2.1.2 Differentiate between microcomputer, minicomputer, and mainframe operating systems including handheld devices (e.g., tablets, PDA, pocket PC, etc.)					NS
2.1.3 Define the role of memory management in an operating system					NS
2.1.4 Describe the system utilities used for file management					NS
2.1.5 Analyze operating system interfaces					NS
2.1.6 Differentiate the features between file systems (e.g. NTFS, FAT32)					NS

Content Standard 2.2: Students evaluate computer memory utilization

BIL: Essential – ISS, NS, IM **Recommended** – PSD

RC:

EDU:	10	12	AD
ISS		I	P
NS		P	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
2.2.1 Differentiate between memory types for PCs, mainframes, minicomputers, and networks					NS
2.2.2 Differentiate between the functions of extended memory, expanded memory, and cache memory					NS
2.2.3 Describe the role of the relationship between memory and software applications					NS
2.2.4 Describe memory management functions (e.g., contiguous allocation, paging, segmentation, virtual memory)					NS
2.2.5 Describe the role of physical memory and registers					NS
2.2.6 Describe the role of overlays, swapping, and partitions					NS
2.2.7 Describe the role of pages and segments					NS
2.2.8 Describe the role of free lists, layout, servers, interrupts, recovery from failures					NS

Content Standard 2.3: Students implement and maintain security compliance

BIL: Essential – ISS, NS **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	P
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
2.3.1 Implement security procedures in accordance with government standards, business ethics		✓			
2.3.2 Ensure compliance with security rules, regulations, and codes		✓			
2.3.3 Analyze security risks (e.g., networking, software, etc.)		✓			
2.3.4 Assess exposure to security issues		✓			
2.3.5 Implement countermeasures		✓			
2.3.6 Install and update virus detection and protection software		✓			
2.3.7 Identify sources of virus infections and remove viruses		✓			
2.3.8 Implement backup and disaster recovery procedures		✓			
2.3.9 Follow disaster plan		✓			
2.3.10 Provide for user authentication (e.g., assign passwords, access level)		✓			
2.3.11 Document security procedures		✓			

Content Standard 2.4: Students apply systems operations procedures

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
2.4.1 Apply basic commands of operating system software					NS
2.4.2 Apply appropriate file and disk management techniques					NS
2.4.3 Access needed information using appropriate reference materials					NS
2.4.4 Review automated scheduling software					NS
2.4.5 Follow power-up and log-on procedures					NS
2.4.6 Interact with/respond to system messages using console device					NS
2.4.7 Run applications/jobs in accordance with processing procedures					NS
2.4.8 Identify scheduling priority in programming					NS
2.4.9 Utilize audit trails					NS
2.4.10 Initiate system software command structures using operating system macro facilities for computer systems					NS
2.4.11 Follow log-off and power-down procedure(s)					NS

Content Standard 2.5: Students maintain and respond to system needs

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	P
PSD		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
2.5.1 Access needed information using appropriate reference materials					NS
2.5.2 Monitor system status and performance					NS
2.5.3 Run diagnostics and respond to system messages					NS
2.5.4 Document computer system malfunction(s) and software malfunction(s)					NS
2.5.5 Install and upgrade software packages					NS
2.5.6 Restore system					NS
2.5.7 Review automated scheduling software					NS
2.5.8 Create a query to extract information from a file or multiple files and create reports					NS

Content Standard 2.6: Students perform standard computer backup procedures

BIL: Essential – ISS, NS, IM **Recommended** –PSD
RC:

EDU:	10	12	AD
ISS		P	R
NS		I	P
PSD		I	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
2.6.1 Recognize the need for regular backup procedures					NS
2.6.2 Plan a backup process					NS
2.6.3 Install backup software					NS
2.6.4 Perform restore operation using backup software					NS
2.6.5 Run compression drive backup software and restore operation using compression drive backup software					NS
2.6.7 Identify and maintain uninterruptible battery backup equipment					NS
2.6.8 Install surge suppression protection					NS
2.6.9 Compare/contrast full, incremental and differential backups					NS

Unit 3: Software Systems Management

Content Standard 3.1 Students perform configuration management activities

BIL: Essential – ISS, NS **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS		I	P
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
3.1.1 Describe identification and control functions		✓			
3.1.2 Explain version management and interface control	✓	✓			
3.1.3 Select appropriate tools for configuration management	✓	✓			
3.1.4 Determine standards to be applied (e.g., international, industry, military)	✓	✓			
3.1.5 Specify baseline and software life-cycle phases	✓	✓			
3.1.6 Assess the impact of changes that affect interfaces		✓			

Content Standard 3.2 Students evaluate application software packages

BIL: Essential – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS			P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
3.2.1 Perform work flow analysis to determine user needs	✓	✓			
3.2.2 Compare/contrast ease of learning, use, and interfacing for different software packages	✓	✓			
3.2.3 Compare/contrast performance and features of different software packages (e.g., speed of retrieval, copying, saving, speller, thesaurus, moving, sorting)	✓	✓			
3.2.4 Compare/contrast ease of technical support for different software packages	✓	✓			
3.2.5 Compare/contrast clarity of documentation for different software packages	✓	✓			
3.2.6 Compare/contrast licensing agreements for different software packages	✓	✓			
3.2.7 Document results of the software evaluation	✓	✓			
3.2.8 Perform a software audit for the purpose of asset management	✓	✓			
3.2.9 Perform a physical audit for the purpose of asset management.	✓	✓			
3.2.10 Evaluate appropriateness of software for specific projects	✓	✓			
3.2.11 Prepare a cost-benefit analysis for a software package	✓	✓			
3.2.12 Develop a method for evaluation	✓	✓			
3.2.13 Test the functionality of proposed software configuration	✓	✓			

Unit 4: Computer User Support

Content Standard 4.1: Students analyze technical support needed

BIL: Essential – ISS, NS **Recommended –** PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS		I	P
PSD			**I**

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
4.1.1 Identify support requirements	✓	✓			
4.1.2 Apply information and data analysis techniques using problem solving and critical thinking skills	✓	✓			
4.1.3 Identify support risks (i.e. security, downtime, etc.)	✓	✓			
4.1.4 Examine present data and system configuration	✓	✓			
4.1.5 Formulate a support plan including service-level agreements	✓	✓			
4.1.6 Utilize technical assistance resources (e.g. knowledge-bases, remote control services, TAC centers, web-based tools, and built-in help functions)	✓	✓			

Content Standard 4.2: Students perform customer service

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
4.2.1 Provide technical support	✓				NS
4.2.2 Respond to user questions	✓				NS
4.2.3 Provide troubleshooting for hardware/software	✓				NS
4.2.4 Communicate and document technical support provided	✓				NS
4.2.5 Optimize system performance	✓				NS
4.2.6 Diagnose problems within system	✓				NS
4.2.7 Perform technical functions required by customer/user within the knowledge set of the technician	✓				NS
4.2.8 Employ technical and computer tools to perform task in the most cost-effective manner	✓				NS
4.2.9 Meet customer expectation in service delivery (e.g. SLA)	✓				NS
4.2.10 Demonstrate effective customer satisfaction skills throughout the service event life cycle	✓				NS

Content Standard 4.3: Students provide support and training

BIL: Essential – ISS, NS **Recommended –** PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS		P	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
4.3.1 Operate help desk	✓				NS
4.3.2 Support computer users	✓				NS
4.3.3 Train computer users	✓				NS
4.3.4 Manage user accounts	✓				NS

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
4.3.5 Update and maintain training and users manuals (soft or hard copies)	✓				NS
4.3.6 Demonstrate ability to guide end-users through a support solution process	✓				NS

Unit 5: Programming Concepts

Content Standard 5.1: Students demonstrate knowledge of programming language concepts

BIL: Essential – PSD **Recommended –** ISS, IM
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	P	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
5.1.1 Describe the concept of problem solving through programming languages			✓		
5.1.2 Describe the concepts of data management through programming languages			✓		
5.1.3 Explain the strength and weaknesses of a language to solve a specific problem			✓		
5.1.4 Describe and demonstrate the function and operation of compilers and interpreters			✓		
5.1.5 Describe the basics of procedural/structured, object-oriented, and event-driven programming			✓		

Content Standard 5.2: Students apply software design techniques

BIL: Essential – PSD **Recommended** – ISS, IM
RC:

EDU:	10	12	AD
ISS		I	R
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
5.2.1 Provide an overview of problem to be solved (PSD)			✓		
5.2.2 Establish basic input and output structures and apply business concepts			✓		
5.2.3 Model solution using both graphical tools (e.g., UML, flowchart, etc.) and pseudo code techniques			✓		

Content Standard 5.3: Students identify models of application

BIL: Essential – PSD **Recommended –** ISS, IM
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	P	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
5.3.1 Identify structured/modular programming			✓		
5.3.2 Identify the characteristics and uses of batch processing			✓		
5.3.3 Identify the characteristics and uses of interactive processing			✓		
5.3.4 Identify the characteristics and uses of event-driven processing			✓		
5.3.5 Identify the characteristics and uses object-oriented processing			✓		

Content Standard 5.4: **Students analyze technical documentation associated with software development**

BIL: **Essential –** ISS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
PSD	I	P	
IM		I	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
5.4.1 Secure needed information using appropriate reference materials	✓		✓	✓	
5.4.2 Analyze specification requirements	✓		✓	✓	
5.4.3 Identify constraints	✓		✓	✓	
5.4.4 Identify input and output (I/O) requirements	✓		✓	✓	
5.4.5 Prepare logic using a design tool	✓		✓	✓	

Unit 6: Applied Programming Languages

Each Content Standard must be addressed in at least *two* of the following language *types*:

- Structural/Procedural (e.g., Basic, C, Visual Basic, RPG, COBOL)
- Data Description (e.g., IOL, SQL, XML)
- Machine Level (e.g., Assembly)
- Object-Oriented (e.g., Java, C++, .NET Framework—all languages)
- Mark-up (e.g., HTML, XHTML, SML, SGML, XML**)**
- Scripting/Control (e.g., PHP, ASP, Javascript, ASP.NET)

Content Standard 6.1: Students demonstrate knowledge of computational and string operations

BIL: **Essential** – PSD **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
6.1.1 Develop code blocks that use numeric operations			✓	✓	
6.1.2 Develop programs that use subtotals and final totals			✓	✓	
6.1.3 Develop code blocks applying string operations (concatenation, pattern matching, substring, etc.)			✓		

Content Standard 6.2: Students demonstrate knowledge of logical operations and control structures

BIL: **Essential –**PSD **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
6.2.1 Solve a truth table			✓		
6.2.2 Explain the concepts of the if/then/else control structure			✓		
6.2.3 Develop code blocks that use relational and compound operators			✓		
6.2.4 Develop code blocks using sequential control structures			✓		
6.2.5 Develop code blocks using repetition control structures (e.g. while, for, etc.)			✓		
6.2.6 Develop code blocks using selection control structures (e.g., case, switch, etc.)			✓		

Content Standard 6.3: Students use integrated development environment to build a program

BIL: **Essential –**PSD **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
6.3.1 Configure preferences and options within a development environment			✓		
6.3.2 Use editors			✓		
6.3.3 Utilize design tool from the integrated development environment (IDE)			✓		

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
6.3.4 Compile or interpret program into runable form			✓		
6.3.5 Run program			✓		
6.3.6 Use tools contained within an IDE			✓		

Content Standard 6.4: Students debug programs

BIL: Essential –PSD **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	P	R

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
6.4.1 Test/run program			✓	✓	
6.4.2 Correct syntax errors			✓	✓	
6.4.3 Correct run-time errors			✓		
6.4.4 Debug logic errors			✓		

Content Standard 6.5: Students develop programs by applying specialized techniques and tools

BIL: Recommended – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	P	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
6.5.1 Develop programs using data-validation techniques			✓		
6.5.2 Develop programs using reuse libraries			✓		
6.5.3 Develop programs using operating system calls			✓		

Content Standard 6.6: Students create deployable programs

BIL: Recommended – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	P	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
6.6.1 Develop user documentation			✓		
6.6.2 Create installation module			✓		
6.6.3 Copy and distribute program			✓		
6.6.4 Evaluate copyright and fair use issues			✓		
6.6.5 Maintain legacy programs			✓		

Unit 7: Software Development Overview

Content Standard 7.1: Students analyze software development methodology

BIL: Essential – PSD **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS			I
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.1.1 Compare various system development life cycles (e.g., waterfall, RUP, iterative)			✓		
7.1.2 Apply the principles of program design (e.g., structured, object-oriented, event-driven)			✓		
7.1.3 Describe how to resolve program implementation issues (e.g., debugging, documentation, auditing, revision control)			✓		
7.1.4 Describe the need for requirements specification document			✓		
7.1.5 Explain the implication of unwritten requirements (e.g., security, integrity, response time, and reliability) on solution design			✓		

Content Standard 7.2: Students plan basic software systems design

BIL: Essential – PSD **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS			I
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.2.1 Access needed information using company and manufacturers' references and/or client input (e.g., procedural manuals, documentation, standards, work flowcharts, interviews)			✓		
7.2.2 Analyze documentation, forms, notes, and source data			✓		
7.2.3 Identify constraints			✓		
7.2.4 Identify system processing requirements			✓		
7.2.5 Identify input and output (I/O) requirements			✓		
7.2.6 Design system inputs, outputs, and processes			✓		
7.2.7 Prepare system logic using design tools			✓		
7.2.8 Define variables			✓		
7.2.9 Select programming language			✓		
7.2.10 Create design documentation			✓		
7.2.11 Design implementation plan			✓		
7.2.12 Design project plan			✓		
7.2.13 Prepare dataflow diagram			✓		
7.2.14 Present system design to management			✓		
7.2.15 Present system design to users			✓		
7.2.16 Select computer-aided software engineering (CASE) tools			✓		
7.2.17 Review design (e.g., peer and/or user walkthrough)			✓		

Content Standard 7.3: Students develop software requirements/specifications

BIL: Essential – ISS, PSD
RC:

EDU:	10	12	AD
ISS			P
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.3.1 Identify the business/organizational problem/objective			✓		
7.3.2 Access needed information using company references (e.g., procedural manuals, documentation, standards, work flowcharts)			✓		
7.3.3 Analyze requirements/specifications using current approaches (e.g., structured analysis, object-oriented analysis, prototyping)			✓		
7.3.4 Clarify specifications using questioning techniques			✓		
7.3.5 Follow specifications or drawings			✓		
7.3.6 Record business process (e.g., using flowchart, step-by-step narrative)			✓		
7.3.7 Prepare test data			✓		
7.3.8 Gather information using interviewing strategies			✓		
7.3.9 Develop informal specifications			✓		
7.3.10 Develop formal specifications			✓		
7.3.11 Identify documentation needs			✓		
7.3.12 Identify computing standards and methodologies			✓		
7.3.13 Identify security measures			✓		
7.3.14 Present software requirements to users			✓		

Content Standard 7.4: Students code programs

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.4.1 Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts)			✓		
7.4.2 Prepare detailed design for coding program			✓		
7.4.3 Generate source code using programming tools in accordance with established standards			✓		
7.4.4 Code and integrate security measures into source code			✓		
7.4.5 Code error-handling techniques			✓		
7.4.6 Interface program with data repository			✓		
7.4.7 Design reports in accordance with system design and user specifications			✓		
7.4.8 Write code to instantiate and print report objects upon user request			✓		
7.4.9 Generate executable code			✓		
7.4.10 Debug compilation errors			✓		
7.4.11 Review code with peers or design team			✓		
7.4.12 Review code with supervisor for efficiency and maintainability					
7.4.13 Report progress based on time line			✓		

Content Standard 7.5: Students execute software testing, validation, change control, error tracking, and documentation

BIL: Essential – PSD **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.5.1 Access needed information			✓		
7.5.2 Develop comprehensive test plan			✓		
7.5.3 Develop test system			✓		
7.5.4 Develop test procedures			✓		
7.5.5 Perform tests			✓		
7.5.6 Document errors			✓		
7.5.7 Perform regression tests			✓		
7.5.8 Update design documentation			✓		
7.5.9 Perform usability and user-acceptance tests			✓		
7.5.10 Prepare and validate user documentation			✓		
7.5.11 Evaluate results with customer/user			✓		
7.5.12 Report progress based on time line			✓		
7.5.15 Prepare and validate program documentation			✓		

Content Standard 7.6: Students evaluate data structures

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.6.1 Explain techniques for data abstraction			✓		
7.6.2 Discuss program design using abstraction			✓		
7.6.3 Explain data structures (e.g., arrays and records, lists, trees, hashing, priority queues and heaps, XML, equivalence relations, and graphs) as they apply to simulation			✓		
7.6.4 Analyze mathematically the efficiency of algorithms that manipulate and use data structures in searching, sorting, dictionary operations, and graphing			✓		
7.6.5 Estimate algorithm efficiency using data structure concepts			✓		

Content Standard 7.7: Students execute software product release and follow-up

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.7.1 Obtain user acceptance					
7.7.2 Participate in development of release plan					
7.7.3 Train technical support staff					
7.7.4 Facilitate transition to the new system					
7.7.5 Participate in development of a user training plan					
7.7.6 Evaluate errors					
7.7.7 Repair errors					
7.7.8 Document errors and repairs					
7.7.9 Implement enhancements					

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
7.7.10 Evaluate enhancements					
7.7.11 Document enhancements					
7.7.12 Obtain user feedback					
7.7.13 Evaluate users' concerns					
7.7.14 Respond to users' concerns					

Content Standard 7.8: Students complete team software engineering project

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
7.8.1 Demonstrate knowledge of the principles and applications of software development team organization					
7.8.2 Gather data to identify customer requirements					
7.8.3 Estimate product life of customer application					
7.8.4 Evaluate functional requirements					
7.8.5 Interpret functional requirements analysis					
7.8.6 Define scope of work to meet customer requirements					
7.8.7 Identify time, technology, and resource constraints					
7.8.8 Estimate project costs					
7.8.9 Apply project planning and scheduling techniques to project development					
7.8.10 Generate design alternatives					
7.8.11 Evaluate design alternatives					
7.8.12 Define system and software requirements					
7.8.13 Validate system requirements					
7.8.14 Establish measurable performance requirements					
7.8.15 Develop software product and project documentation					
7.8.16 Perform software product and project document composition and evaluation					
7.8.17 Conduct software product testing and debugging					
7.8.18 Conduct technical review					

Content Standard 7.9: Students apply computer simulation techniques

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
7.9.1 Demonstrate knowledge of methods for comparing systems using random data					
7.9.2 Demonstrate knowledge of simulation techniques and the analysis of simulation results					
7.9.3 Demonstrate knowledge of experimental design techniques					
7.9.4 Develop experimental designs					
7.9.5 Employ random number generation					
7.9.6 Demonstrate knowledge of random variate generation					
7.9.7 Demonstrate given simulations using a simulator					
7.9.8 Apply queuing systems to a simulation					

Content Standard 7.10: Students demonstrate knowledge of data structures

BIL: **Essential** – PSD
RC:

EDU:	10	12	AD
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.10.1 Demonstrate knowledge of techniques for data abstraction			✓		
7.10.2 Demonstrate knowledge of program design using abstraction			✓		
7.10.3 Demonstrate knowledge of data structures (e.g., arrays and records, lists, trees, hashing, priority queues and heaps, XML, equivalence relations, and graphs) as they apply to simulation			✓		
7.10.4 Analyze mathematically the efficiency of algorithms that manipulate and use data structures in searching, sorting, dictionary operations, and graphing			✓		
7.10.5 Estimate algorithm efficiency using basic database concepts			✓		

Content Standard 7.11: Demonstrate knowledge of knowledge-based (expert) systems

BIL: **Essential** – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.11.1 Demonstrate knowledge of problem analysis and diagnosis methods					
7.11.2 Apply task-level analysis and problem-solving methods to classification problems					
7.11.3 Apply task-level analysis and problem-solving methods to configuration (design) problems					
7.11.4 Identify methods for representing and reasoning with uncertain knowledge					
7.11.5 Demonstrate knowledge of inference-processing basic control strategies (e.g., depth-first, breadth-first)					
7.11.6 Apply forward and backward reasoning to system development					
7.11.7 Demonstrate knowledge of heuristic search strategies					
7.11.8 Explain the difference between expert systems and shells					
7.11.9 Demonstrate knowledge of task-level architectures					
7.11.10 Employ knowledge system development tools					

Content Standard 7.12: Students demonstrate basic knowledge of artificial intelligence (AI)

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.12.1 Demonstrate knowledge of the history, scope and limits of AI, including Turing's test					
7.12.2 Demonstrate knowledge of AI terminology and concepts					
7.12.3 Demonstrate knowledge of the fundamentals of AI problem solving					
7.12.4 Demonstrate knowledge of the fundamentals of knowledge representation logic					
7.12.5 Demonstrate knowledge of knowledge-based systems involving natural language, speech, and vision					
7.12.6 Demonstrate knowledge of the terminology and concepts related to visual perception and computer vision					
7.12.7 Demonstrate knowledge of pattern recognition theory					
7.12.8 Demonstrate knowledge of machine learning theory					
7.12.9 Demonstrate knowledge of robotics					
7.12.10 Demonstrate knowledge of neural networks					
7.12.11 Demonstrate knowledge of rule-based systems and cognitive modeling					
7.12.12 Demonstrate knowledge of the computational techniques used in typical artificial intelligence subareas					
7.12.13 Demonstrate knowledge of the construction of intelligent machines					
7.12.14 Identify current research topics in artificial intelligence					

Content Standard 7.13: Students demonstrate basic knowledge of computational complexity (computability and unsolvability)

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
7.13.1 Demonstrate knowledge of Turing machines and computability					
7.13.2 Demonstrate knowledge of Turing machine construction					
7.11.15 Demonstrate knowledge of Turing machine variants					
7.13.4 Demonstrate knowledge of the Church-Turing thesis and its implications					
7.13.5 Demonstrate knowledge of reductions between languages					
7.13.6 Demonstrate knowledge of decidability and Turing recognizability					
7.13.7 Demonstrate knowledge of the recursion theorem					
7.13.8 Demonstrate knowledge of time and space complexity measures					
7.13.9 Explain the difference between nondeterministic and deterministic complexity					
7.13.10 Demonstrate knowledge of techniques for proving problems hard/complete					
7.13.11 Demonstrate knowledge of basic complexity classes (e.g., LOG, NLOG, P, NP, co-NP, PSPACE, EXP)					

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
7.13.12 Demonstrate knowledge of randomized computation					
7.13.13 Demonstrate knowledge of public-key cryptosystems and cryptography					
7.13.14 Demonstrate knowledge of approximation algorithms					
7.13.15 Demonstrate knowledge of parallel complexity classes					

Content Standard 7.14: Students apply basic knowledge of parallel computing

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
7.14.1 Identify models of parallel computers					
7.14.2 Demonstrate knowledge of basic concepts of parallel computing (e.g., design, implementation, evaluation for shared-memory architectures, local-memory architectures, and vector processors)					
7.14.3 Demonstrate knowledge of basic communication operations					
7.14.4 Demonstrate knowledge of parallel algorithm design and analysis					
7.14.5 Demonstrate knowledge of problem solving on parallel computers					
7.14.6 Demonstrate knowledge of performance and scalability of parallel systems					
7.14.7 Perform parallel programming					
7.14.8 Solve sparse systems of linear equations					
7.14.9 Demonstrate sorting ability					
7.14.10 Perform fast Fornier transforms					
7.14.11 Operate advanced parallel computers (e.g., Cray Y-MP, Cray T3D, IBM SP2 and Convex SPP 12200)					

Unit 8: Application Development Life Cycle

This unit is based upon the integration of multiple programs, components, and data tables into an application or system. Related competencies may be found in "Software Development" which focuses on the development of a single program application.

Content Standard 8.1: Students conduct requirements analysis

BIL: Essential – ISS, PSD
RC:

EDU:	10	12	AD
ISS			P
PSD	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.1.1 Determine development methodology (e.g., waterfall, XP, RUP)			✓		
8.1.2 Define business problem to be solved by the application or system (e.g., through interview process)			✓	✓	
8.1.3 Access needed information using company procedural manuals, references, documentation, and standards			✓	✓	
8.1.4 Define business information requirements			✓	✓	
8.1.5 Determine computer hardware and software needs			✓	✓	
8.1.6 Interpret source data, charts, and graphs			✓	✓	
8.1.7 Review organizational structure			✓	✓	
8.1.8 Interpret existing operating documents and procedures for the system			✓	✓	
8.1.9 Observe existing procedures			✓	✓	
8.1.10 Document existing procedures			✓	✓	
8.1.11 Document possible alternative solutions			✓	✓	
8.1.12 Identify processing requirements			✓	✓	
8.1.13 Define high-level specifications			✓	✓	
8.1.14 Complete a requirements analysis document			✓	✓	
8.1.15 Present findings and recommendations to users and management (e.g., confirm cost/benefit analysis, risk assessment, high-level work plan, project estimate)			✓	✓	

Content Standard 8.2: Students develop system framework

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.2.1 Identify constraints (e.g., political, financial, time, hardware, and systems)			✓		
8.2.2 Select programming language			✓		
8.2.3 Select hardware platform			✓		
8.2.4 Identify and utilize standards and policies as required to govern the development of organizational information technology			✓		
8.2.5 Select tool sets (e.g., code libraries, downloadable classes, testing tools, frameworks, etc.)			✓		
8.2.6 Identify source code control			✓		
8.2.7 Identify communication plan			✓		
8.2.8 Identify risks (attrition, tech assumption, etc.)			✓		

Content Standard 8.3: Students design applications

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.3.1 Identify processing requirements (PSD)			✓		
8.3.2 Implement a simple hierarchy chart /design flowchart			✓		
8.3.3 Create specs with development team			✓		
8.3.4 Divide design specifications into logical blocks (e.g., flowchart, dataflow diagram, process flow, UML)			✓		
8.3.5 Establish input and output (I/O) requirements (e.g., initial user interface, report designs, menus, data communications, handhelds, robotics, etc.)			✓		
8.3.6 Design system input/output processes			✓		
8.3.7 Define configuration options			✓		
8.3.8 Integrate approved data model into design process			✓		
8.3.9 Prepare system logic using design tools			✓		
8.3.10 Organize and present system design deliverables			✓		

Content Standard 8.4: Students develop a series of programs that interact with one another in accordance with programming theory and software development techniques to solve the business problem

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD		P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.4.1 Apply established operating system development tools, commands, utilities, and standards (e.g., naming conventions, indicative data names)			✓		
8.4.2 Evaluate operating system and network system constraints			✓		
8.4.3 Utilize standards when writing source code			✓		
8.4.4 Develop programs utilizing software development appropriate software development techniques, (e.g. looping, arrays, functions)			✓		
8.4.5 Develop programs using file-handling techniques (e.g., config files, .ini files, text files, XML)			✓		
8.4.6 Develop user interfaces			✓		
8.4.7 Develop programs that interface with a data store			✓		
8.4.8 Implement temporary files (e.g., views, cursor files)			✓		
8.4.9 Design reports in accordance with system design and user specifications			✓		
8.4.10 Write code to instantiate and print report objects upon user request			✓		
8.4.11 Code error-handling techniques			✓		
8.4.12 Review/Update system level documentation			✓		
8.4.13 Write callable subroutines, components, methods and classes			✓		

Content Standard 8.5: Students develop a test plan

BIL: Essential – PSD
RC:

EDU:	10	12	AD
PSD	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.5.1 Design/confirm system test plan			✓		
8.5.2 Create test data/results			✓		
8.5.3 Execute the system test plan			✓		
8.5.4 Validate results			✓		
8.5.5 Make changes as required			✓		
8.5.6 Obtain user signoff			✓		

Content Standard 8.6: Students develop user application and Help

BIL: Essential – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.6.1 Identify documentation and Help needs	✓		✓		
8.6.2 Prepare user documentation and Help (e.g., user manuals, help screens)	✓		✓		
8.6.3 Prepare dataflow diagrams for integrated Help	✓		✓		
8.6.4 Update design documentation	✓		✓		
8.6.5 Establish documentation configuration management plan	✓		✓		

Content Standard 8.7: Students install computer application system

BIL: Essential – ISS, PSD
RC:

EDU:	10	12	AD
ISS			P
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.7.1 Review organizational structure	✓		✓		
8.7.2 Create and test deployment media	✓		✓		
8.7.3 Design implementation plan	✓		✓		
8.7.4 Present implementation plan to users and management	✓		✓		
8.7.5 Perform implementation or changeover to new system	✓		✓		
8.7.6 Perform post-implementation evaluation of new system	✓		✓		
8.7.7 Correct deficiencies	✓		✓		
8.7.8 Train personnel	✓		✓		
8.7.9 Identify ongoing support requirements	✓		✓		

Content Standard 8.8: Students execute software product release and follow-up

BIL: Essential – PSD **Recommended** – ISS, NS
RC:

EDU:	10	12	AD
ISS			P
NS		I	P
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.8.1 Obtain user acceptance			✓		
8.8.2 Participate in development of release plan			✓		
8.8.3 Train technical support staff			✓		
8.8.4 Facilitate transition to the new system release			✓		
8.8.5 Participate in development of a user-training plan			✓		
8.8.6 Evaluate defects			✓		
8.8.7 Repair defects			✓		
8.8.8 Document defects and repairs			✓		
8.8.9 Implement enhancements			✓		
8.8.10 Evaluate enhancements			✓		
8.8.11 Document enhancements			✓		
8.8.12 Obtain user feedback			✓		
8.8.13 Evaluate users' concerns			✓		
8.8.14 Respond to users' concerns			✓		

Content Standard 8.9: Students develop team software engineering project

BIL: Essential – PSD **Recommended** – ISS, NS
RC:

EDU:	10	12	AD
ISS			P
NS		I	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.9.1 Discuss the principles and applications of the software development organizational team			✓		
8.9.2 Gather data to identify customer requirements			✓		
8.9.3 Estimate product life or customer application			✓		
8.9.4 Evaluate functional requirements			✓		
8.9.5 Interpret functional requirements analysis			✓		
8.9.6 Define scope of work to meet customer requirements			✓		
8.9.7 Identify time, technology, and resource constraints			✓		
8.9.8 Estimate project costs			✓		
8.9.9 Apply project planning and scheduling techniques to project development			✓		
8.9.10 Generate design alternatives			✓		
8.9.11 Evaluate design alternatives			✓		
8.9.12 Define system and software requirements			✓		
8.9.13 Validate system requirements			✓		
8.9.14 Establish measurable performance requirements			✓		
8.9.15 Develop software product and project documentation			✓		
8.9.16 Perform software product and project document composition and evaluation			✓		
8.9.17 Conduct software product testing and debugging			✓		
8.9.18 Conduct technical review			✓		

Content Standard 8.10: Students apply quality standards

BIL: **Essential** – PSD **Recommended** – ISS, NS
RC:

EDU:	10	12	AD
ISS			P
NS		I	P
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
8.10.1 Identify metrics for measurement			✓		
8.10.2 Establish baseline performance			✓		
8.10.3 Measure actual performance and baseline performance			✓		

Unit 9: Implement and Maintain Business Applications

Based on NSSB Information & Communications Technology Skills Standards

Content Standard 9.1: Students plan rollout and facilitate handoff to customer

BIL: Recommended – ISS
RC:

EDU:	10	12	AD
ISS		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
9.1.1 Create overall project goals and timelines in rollout plan	✓				
9.1.2 Communicate rollout plans to key stakeholders in a timely manner					
9.1.3 Conduct final review and approvals according to company standards					
9.1.4 Identify support staff, training needs, and contingency plans in the rollout plan	✓				
9.1.5 Document contingency plan that is user-friendly					
9.1.6 Test project for errors and seek all approvals prior to delivery to customer	✓				
9.1.7 Test delivered application to assure that it is fully functional for the customer/user and meets all requirements	✓				
9.1.8 Compose support and training materials					

Content Standard 9.2: Students integrate customer feedback

BIL: Recommended – ISS
RC:

EDU:	10	12	AD
ISS		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
9.2.1 Document customer feedback on a continuous basis					
9.2.2 Analyze and prioritize customer needs based on feedback.	✓				
9.2.3 Document changes based on feedback from customer					
9.2.4 Inform customers of applications changes and updates	✓				
9.2.5 Execute change orders in accordance with company procedures to determine project costs and communicate to client					

Content Standard 9.3: Students perform application maintenance

BIL: Recommended – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
9.3.1 Apply the steps to effective problem solving in a timely manner			✓		
9.3.2 Modify changes to applications in a timely and cost-effective manner and track in application life cycle			✓		
9.3.3 Enhance applications without interruption of service			✓		
9.3.4 Solve customer internal, external and global expectations in a timely manner			✓		
9.3.5 Administer backup applications and related data	✓				
9.3.6 Design a plan for disaster recovery	✓				

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
9.3.7 Document modifications to applications			✓		
9.3.8 Archive older versions of applications					
9.3.9 Document interactions resulting in applications changes					

Content Standard 9.4: Students recommend optimization and facilitate upgrades and improvement

BIL: Recommended – ISS
RC:

EDU:	10	12	AD
ISS		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
9.4.1 Document customer feedback and evaluate for feasibility					
9.4.2 Develop recommendation for on-site improvements along with associated budget considerations					
9.4.3 Present recommendations to key stakeholders in accordance to company procedures					
9.4.4 Identify and consider risk assessment					
9.4.5 Test system operation specifications under heavy traffic and load conditions					
9.4.6 Apply performance metrics to system optimization					
9.4.7 Document installation and configuration procedures to aid maintainability and repetition					

Content Standard 9.5: Students administer content

BIL: Recommended – ISS
RC:

EDU:	10	12	AD
ISS		I	R

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
9.5.1 Test site/application after content is updated to ensure integrity					
9.5.2 Perform updates in a timely manner					
9.5.3 Perform updates in accordance with application requirements					
9.5.4 Update content only on appropriate pages in relevant objects of the database					
9.5.5 Update and review links					
9.5.6 Utilize appropriate tools to identify and update content					
9.5.7 Backup site/application and data before performing updates					
9.5.8 Log all update activities					

Content Standard 9.6: Students document application and site changes as it applies to the system environment and application version

BIL: Recommended – ISS
RC:

EDU:	10	12	AD
ISS		I	R

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
9.6.1 Document all changes in accordance with documentation procedures and standards					
9.6.2 Distribute change documentation in a timely manner to relevant personnel and/or departments					

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
9.6.3 Develop and follow change procedures					
9.6.4 Employ backup versions with documented site changes					

Content Standard 9.7: Students monitor performance metrics

BIL: Recommended – ISS
RC:

EDU:	10	12	AD
ISS		I	R

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
9.7.1 Minimize system down time	✓				
9.7.2 Collect and document systematic and ongoing measurement data	✓				
9.7.3 Identify and update metrics	✓				
9.7.4 Monitor and print usage logs on a regular basis in accordance with company procedures	✓				
9.7.5 Monitor system for intrusions and denial of service attacks	✓				
9.7.6 Measure performance statistics using a variety of hardware systems and internal connections	✓				
9.7.7 Document and archive metrics on a regular basis	✓				

Content Standard 9.8: Students implement and support changes in new technology

BIL: Recommended – ISS
RC:

EDU:	10	12	AD
ISS		I	R

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
9.8.1 Implement changes in a timely manner	✓				
9.8.2 Test site/application before changes are incorporated to establish baseline	✓				
9.8.3 Evaluate appropriate browser and device types for functionality and compatibility with new technology					
9.8.4 Verify changes in database functionality					
9.8.5 Test site/application after changes for performance, functionality and reliability	✓				
9.8.6 Document changes in accordance with company standards					
9.8.7 Monitor site page bandwidth usage and customer feedback on a consistent basis and make adjustments accordingly					
9.8.8 Archive older versions of applications					

Unit 10: Basic Server Concepts

Content Standard 10.1: Students demonstrate knowledge of enterprise systems

BIL: Recommended – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	R
PSD		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
10.1.1 Identify types of server memory storage techniques architecture					
10.1.2 Identify data storage techniques used by server operation					
10.1.3 Explain how data is stored in server memory					
10.1.4 Explain how a server system executes program instruction					
10.1.5 Discuss server storage capacity					

Content Standard 10.2: Students design multi-tiered applications

BIL: Recommended – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
10.2.1 Discuss the features, functions, and architectures of client/server computing					
10.2.2 Define the objectives of a client/server application					
10.2.3 Analyze design requirements					
10.2.4 Perform a logical design					
10.2.5 Specify needed technology					
10.2.6 Identify appropriate migration strategies					
10.2.7 Implement online transition processing (OLTP)					
10.2.8 Design online analytical processing (OLAP) for data warehousing					
10.2.9 Design static and dynamic online processing systems (OLIP/OLAP)					
10.2.10 Employ interface techniques					

Content Standard 10.3: Students set up server database systems

BIL: Recommended – PSD
RC:

EDU:	10	12	AD
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
10.3.1 Create client application resources (e.g., icons, menus, windows, dialogs)					
10.3.2 Set up/modify database					
10.3.3 Build a help system					
10.3.4 Connect heterogeneous databases					
10.3.5 Prepare reports using server database					

Content Standard 10.4: Students operate server computer systems

BIL: Recommended – ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
10.4.1 Interpret terminology associated with mainframe computer operation					
10.4.2 Identify data requirements					
10.4.3 Access needed information using standard references and sources					
10.4.4 Perform log-on procedures					
10.4.5 Respond to system messages					
10.4.6 Follow processing procedures for each application/job					
10.4.7 Determine scheduling priority					
10.4.8 Develop audit trails					
10.4.9 Develop a test system plan					
10.4.10 Handle materials and equipment in a responsible manner					
10.4.11 Define user interface standards					
10.4.12 Build a job scheduler					
10.4.13 Determine resources required to distribute the application					

Content Standard 10.5: Students maintain server computer systems

BIL: **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
10.5.1 Solve recoverable problems					
10.5.2 Maintain security					
10.5.3 Maintain computer log					
10.5.4 Perform backup procedure(s)					
10.5.5 Follow log-off procedure(s)					
10.5.6 Establish quality control standards					

Unit 11: Hardware Design, Operation, and Maintenance

Content Standard 11.1: Students demonstrate proficiency in working with microcomputer systems

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.1.1 Identify the essential components of microcomputers and the functions of each component	✓				NS
11.1.2 Discuss the principles and operation of bus concepts (e.g., VESA, EISA, PCI, MCA)	✓				NS
11.1.3 Discuss the operating systems (e.g., WINDOWS, UNIX, DOS)	✓				NS
11.1.4 Differentiate types of input and output devices and peripherals	✓				NS
11.1.5 Discuss the principles and operation of storage devices	✓				NS
11.1.6 Connect input and output ports to peripherals	✓				NS

Content Standard 11.2: Students demonstrate proficiency in working with basic computer system architecture

BIL: Essential – ISS **Recommended –** NS
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.2.1 Explain the principles and operation of addresses and interrupts	✓				NS
11.2.2 Discuss the principles and operation of volatile and nonvolatile memory	✓	✓			

Content Standard 11.3: Students explain the purpose and importance of hardware standards

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS	I	P	R
NS	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.3.1 Identify standard-setting bodies, OSI, IEEE, ISO, and ITU-T (formerly CCITT) standards	✓	✓			
11.3.2 Explain the purpose and importance of each standard setting body	✓	✓			

Content Standard 11.4: Students identify common computing platforms

BIL: Essential – ISS**,** NS, IM
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.4.1 Identify the basic features of standard microprocessors (e.g., Intel family, RISC, AMD) (IM)	✓				NS
11.4.2 Identify standard memory types (e.g., RAM, ROM, DDRAM)	✓				NS
11.4.3 Identify standard input/output devices (e.g., ISA, EISA, PCI, USB, drive controllers, SCSI, PCMCIA, firewire)	✓				NS
11.4.4 Identify the basic features of standard operating systems (e.g., Windows Macintosh OS; Solaris, Linux, UNIX)	✓				NS
11.4.5 Identify the basic features of standard workstations	✓				NS

Content Standard 11.5: Students analyze the computer site environment

BIL: Essential – ISS**,** NS
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.5.1 Analyze environmental and structural requirements, conditions, and limitations (e.g. HVAC, lighting, flooring)	✓	✓			
11.5.2 Categorize power requirements and power supplies	✓	✓			
11.5.3 Analyze environment standards and issues as they pertain to local, state, federal, global, and industry standards	✓	✓			
11.5.4 Identify wiring specifications in compliance with state/local/federal codes	✓	✓			
11.5.5 Specify physical site access and security.	✓	✓			

Content Standard 11.6: Students identify computer architecture and processor types

BIL: Essential – ISS**,** NS **Recommended –** PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.6.1 Compare/contrast the features of different microcomputer processors, minicomputer architecture and processors, and mainframe architecture and processors enterprise mid-range and personal computing	✓				NS
11.6.2 Identify internal system unit components	✓				NS
11.6.3 Compare/contrast system bus structures	✓				NS
11.6.4 Identify appropriate use of architecture alternatives	✓				NS

Content Standard 11.7: Students classify computer architecture components.

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		I	R
PSD			I
IM		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.7.1 Interpret terminology and acronyms related to computer systems architecture	✓	✓			
11.7.2 Identify the input, process, output and storage hardware required in a system	✓				NS
11.7.3 Identify the basic organization of CPU architecture (e.g., Von Neumann, block diagram, data paths, control path, functional units, instruction cycles)	✓				NS
11.7.4 Compare/contrast multiprocessor architectures (e.g., single multiprocessing and distributed processing, stack, array, vector, multiprocessor, hypercube, client server, supercomputers)	✓				NS
11.7.5 Compare/contrast fundamentals of instruction-set types and architectures, including registers and RISC addressing modes	✓				NS
11.7.6 Compare/contrast of data-structure machine representations, including signed integers, character strings, stacks, records, and linked lists	✓				NS
11.7.7 Describe the principles and operation of volatile and nonvolatile memory	✓				NS
11.7.8 Discuss the principles and operation of advanced memory techniques	✓				NS
11.7.9 Identify standard input/output devices and systems, and IO subsystem	✓				NS
11.7.10 Describe the principles and operation of addresses and interrupt processing, and direct-memory-access data-handling system(s) (e.g., CICS)	✓				NS
11.7.11 Define functions of advanced memory techniques (e.g., virtual, pipeline, cache)	✓				NS
11.7.12 Demonstrate appropriate use of command sets to handle tasks in operating systems	✓				NS
11.7.13 Identify cost and performance issues in designing, building or upgrading a computer system	✓				NS

Content Standard 11.8: Students identify and explain CPU and system components

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.8.1 Explain CPU configuration and structure	✓				NS
11.8.2 Describe the characteristics of system boards	✓				NS
11.8.3 Describe the characteristics and operation of interface cards	✓				NS

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
11.8.4 Describe the characteristics and operation of the PCMCIA bus (PC Card and CardBus)	✓				NS
11.8.5 Differentiate between ROM, PROM, EPROM, EEPROM, RAM (including cache)	✓				NS
11.8.6 Differentiate between synchronous and asynchronous circuits	✓				NS

Content Standard 11.9: Students identify and describe connectivity devices

BIL: Essential – ISS**,** NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
11.9.1 Specify the appropriate use, characteristics, and operations of network interface devices	✓	✓			
11.9.2 Discuss the characteristics and operation of analog communication devices (e.g., multiplexers, modems)	✓	✓			
11.9.3 Discuss the characteristics and operation of digital communication devices. (e.g., switches, firewalls, routers, CSU/DSU)	✓	✓			
11.9.4 Differentiate the operation of test equipment (e.g., protocol analyzers, etc.)	✓	✓			
11.9.5 Differentiate wireless technologies (e.g., 802.1x, CDMA, GSM, Microwave, RFID, Bluetooth)	✓	✓			

Content Standard 11.10: Students identify and describe peripheral equipment

BIL: Essential – ISS**,** NS **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD		I	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
11.10.1 Describe storage system concepts and technologies	✓				NS
11.10.2 Identify interfaces between computers and other devices (e.g. Firewire, USB, IEEE, Serial ATA, SCSI)	✓				NS
11.10.3 Define printer types and related interface controllers	✓				NS
11.10.4 Define the use and operation of tape equipment and technologies	✓				NS
11.10.5 Compare and contrast RAID concepts	✓				NS
11.10.6 Compare and contrast network storage (e.g., HAS, SAN, ISCSI, etc.	✓				NS

Content Standard 11.11: Students evaluate cost and performance issues in designing, building or upgrading a computer system

BIL: Essential – ISS**,** NS **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.11.1 Identify and document user hardware/software and network requirements	✓	✓			
11.11.2 Measure software and hardware performance	✓	✓			
11.11.3 Evaluate and recommend products and services and associated costs	✓	✓			
11.11.4 Identify upgrade costs and financial risks and risk management and business continuity	✓	✓			

Content Standard 11.12: Students troubleshoot computer systems

BIL: Essential – ISS**,** NS, IM
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
11.12.1 Test system using diagnostic tools/software	✓				NS
11.12.2 Identify problems in the operating system and related hardware	✓				NS
11.12.3 Differentiate between hardware and software failure	✓				NS
11.12.4 Update flash memory (BIOS)	✓				NS
11.12.5 Optimize hard drive	✓				NS
11.12.6 Gather information on problem from user	✓				NS
11.12.7 Repair/replace malfunctioning hardware	✓				NS
11.12.8 Reinstall software as needed	✓				NS
11.12.9 Recover data and/or files	✓				NS
11.12.10 Restore system to normal operating standards	✓				NS

Unit 12: Fundamentals of Electricity and Electronics Technology

Content Standard 12.1: **Students demonstrate an understanding of electrical fundamentals and safety**

BIL: **Essential –** ISS**,** NS
RC:

EDU:	10	12	AD
ISS	I	P	
NS		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
12.1.1 Explain atomic structure and its relationship to electricity	✓	✓			
12.1.2 Discuss electrical static change and the role of friction	✓	✓			
12.1.3 Follow electrostatic discharge (ESD) preventive procedures	✓	✓			
12.1.4 Identify sources of electricity	✓	✓			
12.1.5 Discuss the principles and operation of electrochemical supplies	✓	✓			
12.1.6 Calculate voltage, current, resistance, power, and energy	✓	✓			
12.1.7 Apply Ohm's law	✓	✓			
12.1.8 Apply power formulas	✓	✓			

Content Standard 12.2: **Students demonstrate knowledge of operating the various types of equipment used to test/measure DC circuits, AC circuits, solid-state devices, digital circuits, analog circuits, and microprocessors**

BIL: **Recommended –** ISS**,** NS
RC:

EDU:	10	12	AD
ISS	I	P	
NS		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
12.2.1 Demonstrate the function and operation of an analog volt-ohm-meter (VOM) (e.g., measure voltage, ohms, and amperage)	✓				
12.2.2 Demonstrate the function and operation of a digital volt-ohm-meter (DMM) e.g., measure voltage, ohms, and amperage)	✓				
12.2.3 Demonstrate the function and operation of a clamp-on amp meter	✓				
12.2.4 Demonstrate the function and operation of oscilloscopes (i.e., voltage over time)	✓				
12.2.5 Demonstrate the function and operation of a logic probe and logic analyzer	✓				
12.2.6 Measure properties of circuits using electrical test/measurement equipment	✓				
12.2.7 Troubleshoot a multi-component electrical circuit using electrical test/measurement equipment	✓				

Content Standard 12.3: Students demonstrate proficiency in working with DC circuits

BIL: Recommended – ISS**,** NS
RC:

EDU:	10	12	AD
ISS	I	P	
NS		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
12.3.1 Compute conductance of conductors and insulators	✓				
12.3.2 Measure resistance and current of conductors and insulators	✓				
12.3.3 Build series, parallel, and combination circuits					
12.3.4 Build voltage divider circuits (loaded and unloaded)					
12.3.5 Compute voltage divider circuits (loaded and unloaded)					
12.3.6 Discuss the electromagnetic properties of circuits and devices	✓				
12.3.7 Discuss the physical and electrical characteristics of capacitors and inductors	✓				

Content Standard 12.4: Students demonstrate proficiency in working with AC circuits

BIL: Essential – ISS**,** NS
RC:

EDU:	10	12	AD
ISS	I	P	
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
12.4.1 List known AC sources	✓	✓			
12.4.2 Explain the principles and operation of various power conditioning systems (e.g., isolation transformers, surge suppressors, uninterruptible power systems)	✓	✓			
12.4.3 Discuss the principles and operation of various safety grounding systems (e.g., lightning arresters, ground electrostatic discharge, fault interrupters)	✓	✓			

Unit 13: Networking

Content Standard 13.1: Students demonstrate knowledge of basic network classifications and topologies

BIL: Essential – ISS, NS **Recommended** – PSD
RC: Networking, Essentials

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
13.1.1 Interpret basic networking terminology	✓	✓			
13.1.2 Differentiate between LANs, CANs, MANs and WANs	✓	✓			
13.1.3 Demonstrate knowledge of how to turn LANs into CANs, MANs, and WANs	✓	✓			
13.1.4 Compare/contrast basic network topologies	✓	✓			
13.1.5 Compare/contrast packet-switching techniques	✓	✓			
13.1.6 Compare/contrast the basic topologies (e.g., star ring, bus)	✓	✓			
13.1.7 Compare the characteristics of connection-oriented and connectionless protocols	✓	✓			
13.1.8 Identify and evaluate standard high-speed networks	✓	✓			
13.1.9 Identify and evaluate emerging networks	✓	✓			
13.1.10 Differentiate network storage techniques (e.g., fiber channel, SCSI, ISCSI)	✓	✓			

Content Standard 13.2: Students demonstrate knowledge of local-area network trends and issues

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
13.2.1 Specify reasons for installing a network	✓	✓			
13.2.2 Trace the evolution of networks	✓	✓			
13.2.3 Analyze current trends and developments in LANs and WANs and wireless networks	✓	✓			

Content Standard 13.3: Students demonstrate knowledge of network physical layer

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
13.3.1 Differentiate between baseband and broadband transmission	✓	✓			
13.3.2 Identify and evaluate the criteria used in making cable selection decisions (e.g., physical properties, transmission technologies, transmission span, bandwidth, topology, security, noise immunity, installation considerations, cost)	✓	✓			

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
13.3.3 Differentiate between physical media types (e.g., coaxial, twisted-pair, optical fibers) and interfaces	✓	✓			
13.3.4 Compare/contrast cable specifications (e.g., CAT5, CAT5E, CAT6+)	✓	✓			
13.3.5 Describe types of cable connectors and grounding techniques	✓	✓			
13.3.6 Describe typical cabling infrastructures	✓	✓			
13.3.7 Identify cable standards (e.g., ANSI, EIA/TIA-568, EIA/TIA-569, TWSS)	✓	✓			
13.3.8 Identify the advantages and disadvantages of cabling systems	✓	✓			
13.3.9 Describe and analyze typical problems associated with cable installation	✓	✓			
13.3.10 Demonstrate cable testing and tolerance levels		✓			
13.3.11 Demonstrate knowledge of radio wave propagation	✓	✓			

Content Standard 13.4: Students demonstrate knowledge of network connectivity basics

BIL: Essential – ISS, NS
RC: N+, A+

EDU:	10	12	AD
ISS	I	P	PR
NS		P	R

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
13.4.1 Identify and describe the characteristics and functions of point-to-point channels, switched, and meshed networks	✓	✓			
13.4.2 Define the characteristics and functions of broadcast channels	✓	✓			
13.4.3 Analyze software used to connect networking devices	✓	✓			
13.4.4 Explain types of interoperability	✓	✓			
13.4.5 Describe and differentiate Internet, Intranet, and Extranet usage and connectivity	✓	✓	✓		

Content Standard 13.5: Students demonstrate knowledge of protocol concepts

BIL: Essential – ISS, NS **Recommended** – PSD
RC: N+, A+

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
13.5.1 Compare/contrast the advantages and disadvantages of standard protocols	✓	✓			
13.5.2 Demonstrate knowledge of network protocols	✓	✓			

Content Standard 13.6: Students demonstrate knowledge of the Open Systems Interconnection (OSI) standard (ISO Standard 7498)

BIL: Essential – NS **Recommended** - ISS
RC: Network

EDU:	10	12	AD
ISS	I	P	PR
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
13.6.1 Identify and analyze the benefits of using a layered network model	✓	✓			
13.6.2 Identify and analyze the seven layers at which decisions must be made according to the OSI standard	✓	✓			
13.6.3 Compare OSI stack positions and their relationship to one another	✓	✓			
13.6.4 Describe actions to be performed at each of the OSI physical layers	✓	✓			
13.6.5 Explain the purposes of, and procedures for, encapsulation and decapsulation	✓	✓			
13.6.6 Describe structure and function of an associate protocol date unit (PDU) at each corresponding OSI layer	✓	✓			

Content Standard 13.7: Students demonstrate knowledge of communication standards for networks

BIL: Essential – NS **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS	I	P	PR
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
13.7.1 Explain digital data communication techniques and standards, including asynchronous and synchronous transmission, error detection and correction codes, and physical interfaces	✓	✓			
13.7.2 Describe data-transmission basics (e.g., SYN, Syn-ack)		✓			
13.7.3 Demonstrate knowledge of various encoding and framing methods (e.g., Manchester, B8Z8)		✓			

Content Standard 13.8: Students demonstrate knowledge of data-encoding basics

BIL: Essential – NS, PSD **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS	I	P	PR
NS		I	P
PSD		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
13.8.1 Apply and convert amongst the four numbering systems: binary, octal, hexadecimal, and decimal numbering systems	✓	✓	✓		
13.8.2 Demonstrate ASCII representation of characters	✓	✓	✓		
13.8.3 Convert between single byte, double byte, and multibyte coding structures (ASCII, EBCDIC, UNICODE)	✓	✓	✓		
13.8.4 Describe the conversion of analog speech to digital	✓	✓	✓		

Content Standard 13.9: Students demonstrate knowledge of IP addressing schemes

BIL: Essential – ISS, NS **Recommended** –PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
13.9.1 Explain how names and addresses are determined for networks	✓	✓			
13.9.2 Identify components of a network address in dotted decimal form (e.g., Class A, B, C)	✓	✓			
13.9.3 Identify the class of network to which a given address belongs	✓	✓			
13.9.4 Explain DHCP—dynamic host configuration protocol					
13.9.5 Differentiate between default subnet masks and variable length subnet masks	✓	✓			
13.9.6 Demonstrate the relationship between an IP address and its associated subnet mask	✓	✓			
13.9.7 Create custom subnet masks to meet network design requirements	✓	✓			
13.9.8 Demonstrate difference between classfull and classless addressing schemes	✓	✓			

Unit 14: Network Architectures

Content Standard 14.1: Students demonstrate knowledge of the basics of network architecture

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
14.1.1 Demonstrate knowledge of the characteristics and uses of network components (e.g., hub, switches, routers, firewall)	✓	✓			
14.1.2 Identify and analyze LAN transmission methods (deterministic vs. non deterministic)	✓	✓			
14.1.3 Demonstrate knowledge of broadband and baseband transmission methods and standards	✓	✓			
14.1.4 Identify and analyze LAN transmission media (e.g., twisted pair, fiber-optic, wireless)	✓	✓			
14.1.5 Evaluate LAN medium-access protocols (e.g., CSMA/CD, CSMA/Computer Applications, token ring, FDDI)	✓	✓			
14.1.6 Identify and analyze the components of, and relationships within, the OSI 8802 (IEEE 802) protocol suite	✓	✓			
14.1.7 Identify and analyze LAN performance factors (e.g., signal attenuation, signal propagation delay)	✓	✓			
14.1.8 Explain and illustrate the reasoning for OSI modeling	✓	✓			
14.1.9 Differentiate between a physical and logical topology	✓	✓			

Content Standard 14.2: Students demonstrate knowledge of the basics of Ethernet technology

BIL: Essential – ISS**,** NS
RC: A+

EDU:	10	12	AD
ISS	I	R	P
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
14.2.1 Describe differences in Ethernet framing	✓	✓			
14.2.2 Select appropriate use of basic Ethernet configurations (e.g., hub, bridges, server, and switch)	✓	✓			
14.2.3 Evaluate the advantages and disadvantages of Ethernet networks as they relate to other networks	✓	✓			

Content Standard 14.3: Students demonstrate knowledge of the TCP/IP protocol suite details

BIL: **Essential –** ISS, NS **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
14.3.1 Compare the basics of TCP/IP layers, components, and functions	✓	✓			
14.3.2 Identify how the TCP layers relate to the OSI model	✓	✓			
14.3.3 Compare and contrast TCP and IP delivery service	✓	✓			
14.3.4 Identify TCP/IP applications and services (e.g., rlogin, SMTP, telnet, FTP, DNS, NFS)	✓	✓			
14.3.5 Explain TCP/IP protocol details (e.g., Internet addresses, ARP, RARP, IP datagram format, IP datagrams, TCP segment format)	✓	✓			
14.3.6 Describe and analyze how TCP/IP uses prioritization and differentiation (e.g., Q.5)	✓	✓			

Unit 15: Network Operating Systems

Content Standard 15.1: Students demonstrate knowledge of the general characteristics of network operating systems

BIL: Essential – ISS, NS
RC: A+, NET+

EDU:	10	12	AD
ISS	I	P	R
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
15.1.1 Identify the purposes of a network operating system (NOS)	✓	✓			
15.1.2 Identify and analyze how the components of a network operating system (e.g., server platform, network services software, network redirection software, communications software) support network operations	✓	✓			
15.1.3 Define the criteria used to evaluate network operating systems	✓	✓			
15.1.4 Identify and analyze how protocols are supported	✓	✓			
15.1.5 Identify and analyze licensing requirements	✓	✓			
15.1.6 Describe the characteristics of a tiered model	✓	✓			
15.1.7 Analyze the advantages and disadvantages of the client/server model	✓	✓			
15.1.8 Compare and contrast various network operating systems	✓	✓			

Content Standard 15.2: Students install and administer network operating system and services

BIL: Essential – ISS, NS
RC: MCSE, CNE, CCNA

EDU:	10	12	AD
ISS		I	P
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
15.2.1 Create and maintain server trusts relationships	✓	✓			
15.2.2 Create, maintain, and implement policies for users, groups, login scripts, and system management	✓	✓			
15.2.3 Grant and control access to files, directories, and shared network resources	✓	✓			
15.2.4 Troubleshoot network performance	✓	✓			
15.2.5 Evaluate pre-installation environment	✓	✓			

Unit 16: Wide-Area Networks

Content Standard 16.1: Students demonstrate knowledge of basic telecommunications and the interconnection of networks

BIL: **Essential –** ISS, NS **Recommended** - IM
RC: **A+**

EDU:	10	12	AD
ISS	I	P	PR
NS		P	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
16.1.1 Describe and analyze different types of WAN connections	✓	✓			
16.1.2 Describe and analyze point-to-point (PPP) interconnection	✓	✓			
16.1.3 Describe and analyze basic telecommunications services (e.g., satellite, circuit switching, packet switching, wireless, building to building)	✓	✓			
16.1.4 Describe and analyze communications carriers and their services	✓	✓			
16.1.5 Identify the role of telecommunications tariffs	✓	✓			

Content Standard 16.2: Students assess user needs for a wide-area network (WAN)

BIL: **Essential –** ISS, NS **Recommended** - IM
RC: **N+**

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
16.2.1 Determine availability from LAN to meet requirements of WAN	✓	✓			
16.2.2 Determine the speed needed between sites to access applications	✓	✓			
16.2.3 Determine the subsets needed on the WAN including VLSM	✓	✓			
16.2.4 Evaluate transmission options	✓	✓			

Content Standard 16.3: Students design WAN systems

BIL: Essential – ISS, NS
RC: MCSE, CNE, CCNA

EDU:	10	12	AD
ISS		I	P
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
16.3.1 Relate voice, data concepts, and video to wide-area networks		✓			
16.3.2 Select primary and backup data circuits		✓			
16.3.3 Evaluate analog and digital transmission for cost, performance, and reliability		✓			
16.3.4 Integrate firewalls to separate trusted network and WAN		✓			
16.3.5 Establish a Virtual Private Network (VPN) over a WAN link		✓			
16.3.6 Determine routers needed to connect with LAN		✓			
16.3.7 Interconnect LANs using WAN services		✓			
16.3.8 Demonstrate cost-savings approaches (e.g. voice/video/data compression)		✓			
16.3.9 Discuss complexities of routing and multiple services over a WAN		✓			
16.3.10 Evaluate network performance needs, establish data priorities, and integrate Q. O. S		✓			

Unit 17: Network Management

Content Standard 17.1: Students demonstrate knowledge of network management activities and procedures

BIL: Essential – ISS, NS **Recommended** – PSD
RC: N+

EDU:	10	12	AD
ISS	I	P	R
NS		I	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.1.1 Evaluate the basic principles of network management	✓	✓			
17.1.2 Identify and categorize server configuration and role (e.g., file server, print server or other network services)	✓	✓			
17.1.3 Determine file organization (e.g., by owners, users, and privileges)	✓	✓			
17.1.4 Establish naming conventions for the network, files, accounts, and services	✓	✓			
17.1.5 Determine methods for increasing performance (e.g., segmenting and balancing the network load, resolving channel and cable bottlenecks)		✓			
17.1.6 Describe and analyze the role of the network manager		✓			
17.1.7 Determine procedures for performance analysis, evaluation, and monitoring		✓			
17.1.8 Determine procedures for network system optimization and tuning		✓			
17.1.9 Determine procedures for managing network assets (e.g., users, groups, printers)		✓			

Content Standard 17.2: Students demonstrate knowledge of network applications

BIL: Essential – ISS, NS **Recommended** – PSD
RC: NET +

EDU:	10	12	AD
ISS	I	P	R
NS		P	R
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.2.1 Describe and analyze how disk storage is shared across a network	✓	✓			
17.2.2 Describe and analyze the differences among application-specific servers (e.g., database, print, communications, terminal, fax, security)	✓	✓			
17.2.3 Identify and analyze the advantages of sharing, backing up, and management of PCs across a network	✓	✓			
17.2.4 Identify software licensing requirements and categories	✓	✓			

Content Standard 17.3: Students solve network applications problems

BIL: Essential – ISS, NS
RC: NET+

EDU:	10	12	AD
ISS	I	P	R
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.3.1 Identify and analyze potential hardware compatibility problems	✓	✓			
17.3.2 Identify and analyze precautions included in programs used on networks (e.g., self-metering, security keys, required configuration settings)	✓	✓			
17.3.3 Identify network areas in which application problems could exist (e.g., memory allocation, file lock settings, resource availability)	✓	✓			
17.3.4 Troubleshoot software problems	✓	✓			
17.3.5 Perform network analysis using monitoring tools	✓	✓			

Content Standard 17.4: Students perform network analysis, selection, and design

BIL: Essential – ISS, NS
RC: MCSE, CNE, CCNA

EDU:	10	12	AD
ISS	I	P	PR
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.4.1 Gather data to identify customer requirements	✓	✓			
17.4.2 Identify system and network requirements	✓	✓			
17.4.3 Analyze requirements	✓	✓			
17.4.4 Define scope of work to meet customer requirements	✓	✓			
17.4.5 Develop functional requirements/specifications for high-level systems	✓	✓			
17.4.6 Identify time, technology, and resource constraints	✓	✓			
17.4.7 Identify physical requirements for system implementation	✓	✓			
17.4.8 Analyze system interdependencies	✓	✓			
17.4.9 Identify alternate solutions	✓	✓			
17.4.10 Research product and vendor architecture and equipment specifications/limitations	✓	✓			
17.4.11 Estimate impact of change request	✓	✓			
17.4.12 Prepare cost/benefit/risk analysis	✓	✓			
17.4.13 Perform human factors analysis	✓	✓			
17.4.14 Participate in design reviews	✓	✓			
17.4.15 Design prototype of system	✓	✓			
17.4.16 Develop testing strategy	✓	✓			
17.4.17 Prepare overall plan for integrating new processes, protocols, and equipment	✓	✓			
17.4.18 Develop deployment strategies appropriate for situation	✓	✓			
17.4.19 Analyze facilities' bandwidth requirements and capacity planning (power cable/wire conduit)	✓	✓			
17.4.20 Revise processes/structure based on testing and certification	✓	✓			
17.4.21 Identify hardware/software selection criteria	✓	✓			
17.4.22 Select a LAN/WAN technology that meets defined set of requirements		✓			

Content Standard 17.5: Students perform network installation procedures

BIL: Essential – ISS, NS
RC: A+, N+

EDU:	10	12	AD
ISS	I	P	PR
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.5.1 Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts)	✓	✓			
17.5.2 Assess user needs to determine which network operating systems to use	✓	✓			
17.5.3 Set up/configure workstation-network connections	✓	✓			
17.5.4 Set up/configure network components (e.g., routers, switches)	✓	✓			
17.5.5 Install LAN operating system	✓	✓			
17.5.6 Configure file server in PC network	✓	✓			
17.5.7 Install network cabling with proper termination according to appropriate standards	✓	✓			
17.5.8 Test network connectivity using a network analyzer	✓	✓			

Content Standard 17.6: Students perform network operation procedures

BIL: Essential – NS **Recommended** - ISS
RC: A+, N+

EDU:	10	12	AD
ISS	I	P	
NS		P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.6.1 Determine the type of wiring needed for the physical connection of the network	✓	✓			
17.6.2 Connect PCs to form a network	✓	✓			
17.6.3 Document LAN configuration	✓	✓			
17.6.4 Identify how the network protocols work together	✓	✓			
17.6.5 Determine compatibility of various networks	✓	✓			
17.6.6 Set up/configure TCP/IP services on workstations and network servers	✓	✓			
17.6.7 Implement print queue in a network	✓	✓			
17.6.8 Perform file copy over a network	✓	✓			
17.6.9 Install/configure file server in a network	✓	✓			

Content Standard 17.7: Students perform hardware and desktop support

BIL: Essential – ISS, NS
RC: A+, N+

EDU:	10	12	AD
ISS	I	P	R
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.7.1 Install and use network printers	✓	✓			
17.7.2 Determine physical and virtual connections	✓	✓			
17.7.3 Create a mapped network object	✓	✓			
17.7.4 Replace computer hardware	✓	✓			
17.7.5 Set up system configuration	✓	✓			
17.7.6 Start up/shut down system	✓	✓			
17.7.7 Install software packages	✓	✓			
17.7.8 Respond to system messages	✓	✓			
17.7.9 Troubleshoot system	✓	✓			
17.7.10 Perform system analysis	✓	✓			
17.7.11 Perform preventive maintenance	✓	✓			
17.7.12 Perform software license audits	✓	✓			
17.7.13 Coordinate security procedures	✓	✓			

Content Standard 17.8: Students perform network administration

BIL: Essential – NS, ISS
RC: MCSE, CNE, CCNA, A+, N+

EDU:	10	12	AD
ISS	I	P	PR
NS	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.8.1 Define the role of the LAN administrator	✓	✓			
17.8.2 Implement system security policies	✓	✓			
17.8.3 Install network management software	✓	✓			
17.8.4 Perform administration functions using network management software		✓			
17.8.5 Perform bandwidth optimization	✓	✓			
17.8.6 Respond to system messages	✓	✓			
17.8.7 Troubleshoot system	✓	✓			
17.8.8 Install and monitor server software applications	✓	✓			
17.8.9 Perform system analysis	✓	✓			
17.8.10 Perform preventive maintenance	✓	✓			
17.8.11 Perform resource management (e.g., apply standards, address protocols, monitor network activity, perform trend analyses, functional verifications, audits, and monitoring)	✓	✓			
17.8.12 Coordinate security procedures	✓	✓			
17.8.13 Document actions taken (e.g., backups, virus prevention, and software distribution)	✓	✓			
17.8.14 Execute network diagnostics program for software and hardware		✓			
17.8.15 Apply standard policies	✓	✓			
17.8.16 Establish a preventive maintenance schedule	✓	✓			
17.8.17 Document and diagram network topology	✓	✓			
17.8.18 Describe authentication process to network devices for users	✓	✓			

Content Standard 17.9: Students perform network maintenance and diagnostics and testing

BIL: Essential – NS **Recommended** – ISS
RC: MCSE, CNE, CCNA

EDU:	10	12	AD
ISS	I	P	PR
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.9.1 Perform preventive maintenance	✓	✓			
17.9.2 Respond to system messages	✓	✓			
17.9.3 Troubleshoot system	✓	✓			
17.9.4 Restore LAN operating systems	✓	✓			
17.9.5 Replace LAN hardware components	✓	✓			
17.9.6 Define the scope and applicability of the test	✓	✓			
17.9.7 Develop a test plan		✓			
17.9.8 Identify needed resources		✓			
17.9.9 Obtain needed resources		✓			
17.9.10 Assess network impact		✓			
17.9.11 Set up test environment		✓			
17.9.12 Set up testing schedule		✓			
17.9.13 Execute testing in accordance with established plans and schedule		✓			
17.9.14 Document errors reported/tracked		✓			
17.9.15 Interpret test results		✓			
17.9.16 Develop central log strategy for network devices		✓			

Content Standard 17.10: Students explain disaster recovery and business continuance

BIL: Essential –NS, ISS –
RC: MCSE, CNE, CCNA

EDU:	10	12	AD
ISS		I	R
NS		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
17.10.1 Differentiate between disaster recovery and business continuity	✓	✓			
17.10.2 Identify common backup devices	✓	✓			
17.10.3 Identify the criteria for selecting a backup system	✓	✓			
17.10.4 Establish process for archiving files	✓	✓			
17.10.5 Develop and test a disaster recovery plan	✓	✓			
17.10.6 Develop a business resumption plan	✓	✓			
17.10.7 Identify method for avoiding common computer system disasters (e.g. UPS, RAID)	✓	✓			

Unit 18: Security Fundamentals

Content Standard 18.1: Students examine the history and components of information assurance

BIL: Essential – ISS**,** NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		I	P
PSD		I	P
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
18.1.1 Identify significant advances in the development of computer security and the trend towards information assurance	✓	✓	✓	✓	
18.1.2 Describe the evolution of major threats to computers including physical security, viruses, worms, spyware, malware, and hacker attempts and the influence this has had on the current state of information assurance	✓	✓	✓	✓	
18.1.3 Discuss the role of the government in evolving standards and security initiatives (e.g. encryption, cryptography)	✓	✓	✓	✓	
18.1.4 Describe the role of networking and the increased need for security and information assurance	✓	✓	✓	✓	
18.1.5 Discuss how legislative and ethical issues and standards have impacted network security (e.g. HIPPA, GLBA, SOX)	✓	✓	✓	✓	
18.1.6 Discuss the need for confidentiality, integrity, and availability of information (CIA)	✓	✓	✓	✓	
18.1.7 Discuss the need for authentication and non-repudiation of information (e.g. PKI)	✓	✓	✓	✓	
18.1.8 Illustrate security risks and associated safeguards	✓	✓	✓	✓	
18.1.9 Examine the role of government-industry-academia partnerships in increasing the information assurance levels domestically and globally	✓	✓	✓	✓	
18.1.10 Identify and discuss careers and certification programs associated with security.	✓	✓	✓	✓	
18.1.11 Discuss the role of risk management in protecting information and information systems	✓	✓	✓	✓	
18.1.12 Examine the role of policy in protecting information and information systems	✓	✓	✓	✓	

Content Standard 18.2: Students describe the components associated with computer and network security systems

BIL: Essential – ISS**,** NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		I	P
PSD		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
18.2.1 Identify and discuss biometric systems (e.g., fingerprinting, retina scans, voice analysis, etc.)	✓	✓	✓		
18.2.2 Describe two-factor authentication techniques (e.g., smart cards)	✓	✓	✓		
18.2.3 Explain the role of digital signatures in achieving information assurance and integrity	✓	✓	✓		
18.2.4 Explain the role of digital certifications in achieving information assurance	✓	✓	✓		
18.2.5 Explain the role of hashing algorithms (e.g., MD5, SHA1) in achieving information assurance and integrity	✓	✓	✓		
18.2.6 Discuss the importance for the need for an organizational policy addressing confidentiality	✓	✓	✓		
18.2.7 Discuss the need, importance, and implementation of Intrusion Detection Systems	✓	✓	✓		
18.2.8 Discuss the need, importance, and implementation of firewalls	✓	✓			
18.2.9 Discuss the need and importance of antivirus, anti-spyware, and content filtering software	✓	✓			
18.2.10 Discuss the need and importance of BIOS security (passwords, prevention of BIOS changes)	✓	✓			
18.2.11 Discuss the needs and importance of security updates, patches, or fixes)	✓	✓			

Unit 19: Secure Network Management

Content Standard 19.1: Students implement secure network management activities and procedures

BIL: Essential – NS, ISS
RC:

EDU:	10	12	AD
ISS	I	P	PR
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
19.1.1 Identify need for data protection	✓	✓			
19.1.2 Identify need for network security	✓	✓			
19.1.3 Analyze network security issues (e.g., physical facility)	✓	✓			
19.1.4 Identify security requirements	✓	✓			
19.1.5 Analyze the advantages/disadvantages of firewall architectures	✓	✓			
19.1.6 Select the appropriate security appliance (e.g., combined firewall routers, proxy server software solutions, dedicated software solutions, dedicated appliances)	✓	✓			
19.1.7 Identify specific access levels that need to be accommodated	✓	✓			
19.1.8 Determine how to protect against spoofing	✓	✓			
19.1.9 Devise account administration functions to support network security (e.g., managing access control lists (ACL) of network resources)	✓	✓			
19.1.10 Develop and establish best practices in security plans	✓	✓			
19.1.11 Match security system design to identified security requirements	✓	✓			
19.1.12 Analyze and discuss security issues and how they are mitigated with the use of software distribution management systems (e.g. patch management)	✓	✓			

Content Standard 19.2: Students describe risk analysis

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS		I	R
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
19.2.1 Discuss the balance between risk, cost, security, and implementation	✓	✓			
19.2.2 Discuss a variety of security architectures and their application as they pertain to business networks	✓	✓			
19.2.3 Describe risks based on vulnerability level, likelihood level, and impact level to the organization	✓	✓			

Content Standard 19.3: Students explain information technology mechanisms as they apply to a multilayer defense structure

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS		I	R
NS			P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
19.3.1 Discuss currently available intrusion prevention, detection, and mitigation systems	✓	✓			
19.3.2 Illustrate auditing and log file management, e.g., archiving, clearing, sizing	✓	✓			
19.3.3 Discuss incident handling procedures, including involvement of CERT and law enforcement	✓	✓			
19.3.4 Identify security risks and breeches by reviewing system logs	✓	✓			
19.3.5 Discuss concepts and principles in packet inspection and filtering (e.g. firewall and routers)	✓	✓			
19.3.6 Discuss concepts as they pertain to blackhole lists, spam services, open relay and other types of attacks	✓	✓			
19.3.7 Compare and contrast network analysis tools that identify security risks and vulnerabilities	✓	✓			
19.3.8 Discuss theory of secure network management with VLANs and out-of-band networks	✓	✓			
19.3.9 Discuss information asset identification and classification and disposal	✓	✓			
19.3.10 Discuss concepts as they relate to human security (e.g. social engineering)	✓	✓			

Content Standard 19.4: Students explain communication in a WAN environment

BIL: Essential –NS **Recommended -** ISS
RC:

EDU:	10	12	AD
ISS		I	R
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
19.4.1 Differentiate the use of tunneling protocols both hardware and software in securing communication (e.g., L2TP, PPTP)		✓			
19.4.2 Describe methods for encrypting communication (e.g., IPSEC)		✓			
19.4.3 Describe VPNs using tunneling protocols and encrypting techniques		✓			
19.4.4 Explain the use of enterprise authentication management in securing communications		✓			
19.4.5 Discuss the role of certificate authorities		✓			

Unit 20: Wireless

Content Standard 20.1: Students explain wireless communications

BIL: Essential – ISS**,** NS
RC:

EDU:	10	12	AD
ISS	I	P	PR
NS		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
20.1.1 Compare and contrast various wireless protocols in common use	✓	✓			
20.1.2 Compare and contrast various characteristics of wireless signals, e.g., reflection, diffraction, scattering and fading	✓	✓			
20.1.3 Differentiate medium access methods used by wireless	✓	✓			
20.1.4 Describe and define other wireless communication standards in use today as they apply to personal, corporate, and public use (e.g., Bluetooth)	✓	✓			
20.1.5 Describe appropriate applications of wireless technologies to specific communication scenarios	✓	✓			

Content Standard 20.2: Students design and implement a wireless network solution

BIL: Essential –NS **Recommended** –ISS
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
20.2.1 Compare and contrast wireless solutions operating in ad hoc mode and infrastructure mode	✓	✓			
20.2.2 Describe the various frequency ranges and associated rules in the wireless spectrum as managed by the Federal Communication Commission (FCC)	✓	✓			
20.2.3 Define the Service Set Identifier (SSID) as used in wireless communications	✓	✓			
20.2.4 Select and install access points, wireless NICs, antennas and other hardware and software components to provide a wireless networking solution as determined by a site and customer survey	✓	✓			
20.2.5 Troubleshoot Wireless LANs using system logs, vendor provided utilities and diagnostic tools	✓	✓			

Content Standard 20.3: Students evaluate security concerns specific to wireless networks and devices, and techniques for minimizing those risks

BIL: Essential –NS **Recommended** – ISS, IM
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
20.3.1 Define and describe the practice of "war driving" and how to mitigate this risk	✓	✓			
20.3.2 Explain various methods of increasing the security of a wireless network, e.g., MAC address filtering, Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA), 802.1x and RADIUS	✓	✓			
20.3.3 Compare and contrast various methods, with their strengths and weaknesses, of encrypting wireless communications	✓	✓			
20.3.4 Identify security enhancements provided by IEEE 802.11(x)	✓	✓			
20.3.5 Define practices and policies to prevent and detect installation of unauthorized Wireless Access Points (WAPs)	✓	✓			
20.3.6 Demonstrate ethical wireless access practices	✓	✓			

Unit 21: Telecommunications

Content Standard 21.1: Students demonstrate knowledge of transmission line applications

BIL: Essential –NS **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS	I	P	PR
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
21.1.1 Define power conversion	✓	✓			
21.1.2 Discuss the principles and operation of two-wire and four-wire transmission lines	✓	✓			
21.1.3 Discuss the principles and operation of coaxial cable	✓	✓			
21.1.4 Discuss the principles and operation of a microwave, satellite, and laser transmissions and receptions.	✓	✓			
21.1.5 Discuss the principles and operation of optical, analog, and digital transmissions	✓	✓			
21.1.6 Compare transmission speeds of various media	✓	✓			

Content Standard 21.2: Students demonstrate proficiency in working with communications systems

BIL: Essential –NS **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS	I	P	PR
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
21.2.1 Discuss techniques for communication media splicing and termination	✓	✓			
21.2.2 Differentiate between various communications systems	✓	✓			
21.2.3 Identify the characteristics and components of cabling systems	✓	✓			
21.2.4 Identify bandwidth and attenuation limitations for communications systems (e.g. fiber, copper, wireless)	✓	✓			
21.2.5 Identify the characteristics of various types of light sources and light detectors used in fiber optic systems	✓	✓			
21.2.6 Identify the components of fiber optic transmission systems and the function of each (e.g., CWDM, DWDM)	✓	✓			
21.2.7 Discuss how data signals are transformed into light pulses	✓	✓			
21.2.8 Operate a simple fiber optic data transmission system	✓	✓			
21.2.9 Discuss the characteristics of multi-mode and single-mode systems	✓	✓			

Content Standard 21.3: Students demonstrate knowledge of telecommunications networks

BIL: Essential –NS **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS	I	P	PR
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
21.3.1 Discuss the role telecommunication networks play in the contemporary business environment	✓	✓			
21.3.2 Discuss how voice, data, and video inputs are converted to electromagnetic signals	✓	✓			
21.3.3 Discuss advanced telecommunication broadband technologies	✓	✓			
21.3.4 Discuss the characteristics and function of ISDN and BRI, PRI signaling	✓	✓			
21.3.5 Discuss mobile communications technologies, including cellular and personal communication networks	✓	✓			
21.3.6 Discuss the characteristics and function and types of data compression and generational losses	✓	✓			
21.3.7 Discuss the function and characteristics DSL technologies	✓	✓			

Unit 22: Information Systems (IS) Fundamentals

Content Standard 22.1: Students explain systems concepts and foundations.

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS		I	P
PSD		I	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
22.1.1 Explain the underlying concepts of the information systems discipline	✓				
22.1.2 Compare/contrast data, information, and knowledge	✓				
22.1.3 Compare methods for achieving productivity in knowledge work	✓				
22.1.4 Apply general systems theory to the analysis and development of an information system	✓				
22.1.5 Identify the properties of open and proprietary systems	✓	✓			
22.1.6 Define the relationship between system components	✓				
22.1.7 Characterize the role of data representation, both non-numeric and numeric (e.g., integers, reals, errors)	✓				
22.1.8 Identify procedures for formal problem solving	✓				
22.1.9 Differentiate between the role of information systems within a company and their role in a global environment	✓				
22.1.10 Identify the essential properties of information systems	✓				

Content Standard 22.2: Students define information system infrastructure

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS		I	P
PSD		I	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
22.2.1 Identify systems architecture	✓				
22.2.2 Identify the components of the information system infrastructure (e.g., hardware, communications, systems, site)	✓				
22.2.3 Identify the relationship of users and suppliers to the information system	✓				
22.2.4 Identify the objectives of information system	✓				
22.2.5 Identify the process for selecting software products and processes	✓				
22.2.6 Outline the system controls (i.e. change management, service level agreement SLA)	✓				

Content Standard 22.3: Students evaluate systems development approach

BIL: Essential – ISS **Recommended** –NS, PSD
RC:

EDU:	10	12	AD
ISS			I
NS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
22.3.1 Summarize application planning, development, and risk management for information system	✓				
22.3.2 Identify potential problems in system implementation	✓				
22.3.3 Determine whether prototyping system is feasible	✓				
22.3.4 Evaluate third-party products to include in the project implementation	✓				
22.3.5 Develop a plan using data-oriented techniques	✓				
22.3.6 Apply object-oriented development techniques	✓				
22.3.7 Apply process-oriented development techniques	✓				
22.3.8 Evaluate systems engineering considerations	✓				
22.3.9 Determine system design process, from specification to implementation	✓				
22.3.10 Appraise system process and product life-cycle models	✓				
22.3.11 Assess system design methods and tools	✓				

Content Standard 22.4: Students compare/contrast individual and collaborative team building.

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS			P
NS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
22.4.1 Identify stakeholders in a given IS context (i.e., key individuals)	✓				
22.4.2 Identify desired group and team behavior in an IS context	✓				
22.4.3 Describe how to apply team methods to empower coworkers	✓				
22.4.4 Define empowerment and effectiveness measurement	✓				
22.4.5 Identify knowledge-building and knowledge-maintaining tasks	✓				
22.4.6 Differentiate between individual and group technology	✓				
22.4.7 Describe the characteristics and attributes of knowledge work for both individual and group technology	✓				
22.4.8 Describe group support technology for common knowledge requirements	✓				
22.4.9 Identify work modifications necessitated by working in groups (e.g., additional processing)	✓				
22.4.10 Describe the information analysis process	✓				
22.4.11 Describe information technology solutions	✓				

Content Standard 22.5: Students assess and design systems prior to implementation

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
22.5.1 Assess requirements through interviewing of individuals and groups	✓				
22.5.2 Assess information requirements through analysis of individual and group tasks	✓				
22.5.3 Assess information technology requirements for given worksite	✓				
22.5.4 Design overall implementation strategy (e.g., top-down, bottom up; teams vs. individual)	✓				
22.5.5 Design the interaction of the operating system and hardware architecture	✓				
22.5.6 Design ownership of data and system	✓				
22.5.7 Design methods for providing computing support and training for the end user	✓				
22.5.8 Design measures to ensure system integrity	✓				
22.5.9 Design computer hardware	✓				
22.5.10 Design the data structures to be implemented	✓				

Content Standard 22.6: Students measure, report, and recommend system solutions

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
22.6.1 Evaluate potential systems solutions against criteria for success	✓				
22.6.2 Apply continuous improvement methodologies	✓				
22.6.3 Identify quality standards to be documented (e.g., ITIL—a service management standard, Baldridge)	✓				
22.6.4 Identify the competitive advantage achieved through IS	✓				
22.6.5 Specify measurements to be taken	✓				
22.6.6 Assign responsibility for documentation	✓				
22.6.7 Define how information and information systems will be used in documentation and decision making	✓				
22.6.8 Establish the relationship between systems goals and quality concepts	✓				

Unit 23: Information Systems

Content Standard 23.1: Students develop and implement organizational planning for information systems

Note: Content Standard 25.1 should be a prerequisite for Content Standard 23.1.

BIL: Essential – ISS **Recommended –**PSD, NS
RC:

EDU:	10	12	AD
ISS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
23.1.1 Analyze the strategic role of information systems in organizations	✓				
23.1.2 Identify information technology needed to support given sets of tasks and activities for individuals, workgroups, and the organization	✓				
23.1.3 Align IS planning with enterprise planning	✓				
23.1.4 Define the strategic relationship of IS activities to enhancing competitive position	✓				
23.1.5 Differentiate between strategic tactical and operational level applications	✓				
23.1.6 Define the IS role in process re-engineering	✓				
23.1.7 Develop short-range IS plan	✓				
23.1.8 Develop continuous improvement plan	✓				
23.1.9 Specify functional structures (internal vs. outsourcing)	✓				
23.1.10 Establish goals and objectives for IS	✓				
23.1.11 Define mission and critical success factors	✓				

Content Standard 23.2: Students identify and define roles and functions for IS management

BIL: Essential – ISS **Recommended** – PSD, NS
RC:

EDU:	10	12	AD
ISS		I	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
23.2.1 Identify hierarchical and flow models of the organization	✓				
23.2.2 Identify organizational work groups	✓				
23.2.3 Define the roles of professional IS personnel within the organization	✓				
23.2.4 Define the function of IS management	✓				
23.2.5 Identify drivers and inhibitors of information technology change in the organization	✓				
23.2.6 Define the role of the cognitive process in information systems design and implementation	✓				
23.2.7 Identify IS support for decision making	✓				

Content Standard 23.3: Students perform IS functions

BIL: Essential – ISS **Recommended** – PSD, NS
RC:

EDU:	10	12	AD
ISS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
23.3.1 Compare/contrast the advantages and disadvantages of various options for outsourcing IS function	✓				
23.3.2 Conduct internal and external performance evaluations for IS function	✓				
23.3.3 Create technical and end-user telecommunication system documentation	✓				

Content Standard 23.4: Students apply management principles to IS functions

BIL: Recommended – ISS, PSD, NS
RC:

EDU:	10	12	AD
ISS			
PSD			I
NS			

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
23.4.1 Identify the characteristics of principle-centered leadership					
23.4.2 Implement a proactive approach to IS management					
23.4.3 Devise techniques to enhance the creative design process					

Content Standard 23.5: Students assess and manage IS functions

BIL: Recommended – ISS, PSD, NS
RC:

EDU:	10	12	AD
ISS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
23.5.1 Identify security and privacy considerations					
23.5.2 Analyze configuration controls					
23.5.3 Develop DBMS projects, including systems development and user documentation					
23.5.4 Manage computer facilities					
23.5.5 Manage group decision support systems					
23.5.6 Justify the project management approach to be implemented					
23.5.7 Devise techniques to enhance creative problem solving					

Unit 24: Information System Analysis and Design

Note: Unit 27 is a prerequisite for Unit 29

Content Standard 24.1: Students evaluate the role of systems analysts

BIL: Essential – ISS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
24.1.1 Identify the functions of systems analysts	✓				
24.1.2 Identify the skills required for systems analysts	✓				

Content Standard 24.2: Students initiate a system project

BIL: Essential – ISS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
24.2.1 Identify the phases in a system project	✓				
24.2.2 Select basic fact-gathering techniques to be used	✓				
24.2.3 Define the scope of the systems project	✓				
24.2.4 Conduct a preliminary investigation	✓				

Content Standard 24.3: Students conduct a detailed system investigation and analysis

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS			I
NS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
24.3.1 Identify time, technology and resource constraints	✓				
24.3.2 Determine investigation techniques to be used	✓				
24.3.3 Record facts gathered through system investigation	✓				
24.3.4 Perform appropriate diagnostic tests	✓				
24.3.5 Investigate system alerts	✓				
24.3.6 Research technical alternatives	✓				
24.3.7 Evaluate technical alternatives	✓				

Content Standard 24.4: Students design an information system

BIL: Essential – ISS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
24.4.1 Execute the steps in system design	✓				
24.4.2 Design system output, system input, files, and processing	✓				
24.4.3 Analyze the interaction of the operating system and hardware architecture	✓				
24.4.4 Justify the communications selections for the system (e.g., single PCs, LANs and/or WANs)	✓				
24.4.5 Present system design to management	✓				
24.4.6 Design networked solutions	✓				

Content Standard 24.5: Students develop the information system

BIL: Essential – ISS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
24.5.1 Execute tasks involved in system development	✓				
24.5.2 Identify the system components and their relationships	✓				
24.5.3 Specify the workflow system	✓				
24.5.4 Develop programming specifications	✓				
24.5.5 Program the system	✓				
24.5.6 Test the system	✓				
24.5.7 Document the system	✓				

Content Standard 24.6: Students evaluate applications within the information system

BIL: Essential – ISS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS		I	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
24.6.1 Design a framework for evaluating information system applications	✓				
24.6.2 Compare the capabilities of an application with the requirements it is intended to meet	✓				
24.6.3 Identify alternative outcomes of the application verification process	✓				
24.6.4 Evaluate the results and the probabilities of errors in application software	✓				
24.6.5 Modify inputs, outputs, and processing to refine an application	✓				
24.6.6 Recommend new features or enhancements to existing tools	✓				

Content Standard 24.7: Students develop IS implementation plan

BIL: Essential – ISS **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS			I
NS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
24.7.1 Analyze the effect of IS on the organizational structure	✓				
24.7.2 Differentiate the interaction between IS and continuous improvement	✓				
24.7.3 Specify the teamwork, leadership, and empowerment strategies to be used	✓				
24.7.4 Specify consensus-building process to be used	✓				
24.7.5 Specify the system conversion method to be used	✓				
24.7.6 Document system implementation plans	✓				

Content Standard 24.8: Students perform management functions related to the planned change

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS			P
NS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
24.8.1 Schedule system change according to risk	✓	✓			
24.8.2 Secure needed approvals for change	✓	✓			
24.8.3 Document contingency plans	✓	✓			
24.8.4 Complete a time line for the implementation of change	✓	✓			
24.8.5 Perform regression tests	✓	✓			
24.8.6 Document testing results	✓	✓			
24.8.7 Initiate problem correction	✓	✓			

Unit 25: System Installation, Maintenance, and Troubleshooting

Content Standard 25.1: Students explain the life cycle maintenance of an information system

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS	I	R	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.1.1 Research the concept of information system life cycles	✓				
25.1.2 Identify criteria for deciding between acquisition of software packages and custom development of software	✓				

Content Standard 25.2: Students implement a system

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS	I	R	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.2.1 Develop a detailed training, conversion, and installation plan for an information system application	✓				
25.2.2 Install DBMS on the server	✓				
25.2.3 Install appropriate operating system and telecommunications hardware and software	✓				
25.2.4 Install information system application program in accordance with requirements	✓				
25.2.5 Evaluate processes and outcomes	✓				
25.2.6 Operate server applications	✓				
25.2.7 Operate coupled application systems	✓				
25.2.8 Evaluate emerging technologies and their potential effect on information system software	✓				
25.2.9 Evaluate installation requirements	✓				

Content Standard 25.3: Students perform software configuration and installation

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS	I	R	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.3.1 Develop program and system specifications according to client needs	✓	✓			
25.3.2 Install software with minimum disruption of process flow	✓	✓			
25.3.3 Configure software appropriately for system and user application	✓	✓			

Content Standard 25.4: Students monitor the information system

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.4.1 Conduct post-implementation evaluation	✓				
25.4.2 Identify abnormal system performance	✓				
25.4.3 Recognize system alerts	✓				
25.4.4 Recognize security problems	✓				
25.4.5 Recognize environmental problems	✓				
25.4.6 Perform remote monitoring	✓				

Content Standard 25.5: Students perform systems maintenance

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS	I	P	R
NS			P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.5.1 Demonstrate the basic elements of computer maintenance (e.g., Service Level Agreement outside vendor management)	✓				
25.5.2 Identify available diagnostic tools used for system maintenance	✓				
25.5.3 Identify maintenance procedures and processes	✓				
25.5.4 Identify problems using diagnostic tools	✓				
25.5.5 Assemble and disassemble computer	✓				
25.5.6 Establish a preventive maintenance plan	✓				
25.5.7 Perform maintenance and change control	✓				

Content Standard 25.6: Students manage backup and recovery, both on and off-site

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS			P
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.6.1 Create backup and recovery plan to be used by technical support group and users		✓			
25.6.2 Implement backup procedures in accordance with a regular schedule		✓			
25.6.3 Implement recovery procedures as needed		✓			

Content Standard 25.7: Students troubleshoot problems

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS		P	R
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.7.1 Demonstrate basic troubleshooting procedures	✓	✓			
25.7.2 Diagnose computer problems	✓	✓			
25.7.3 Develop resolution plan	✓	✓			
25.7.4 Test identified solutions	✓	✓			
25.7.5 Implement selected solution	✓	✓			
25.7.6 Use/utilize a knowledge base	✓	✓			

Content Standard 25.8: Students evaluate problem-solving processes and results

BIL: Essential – ISS, NS
RC:

EDU:	10	12	AD
ISS		P	R
NS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.8.1 Evaluate problem-solving outcomes to determine whether the problem was solved as intended	✓	✓			
25.8.2 Evaluate whether the process was applied in an efficient and responsible manner	✓	✓			
25.8.3 Determine needed follow-up actions	✓	✓			
25.8.4 Document the problem and add to the knowledge base	✓	✓			

Content Standard 25.9: Students install software, upgrades, and apply patches

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
25.9.1 Identify principles governing software acquisition and upgrades	✓	✓			
25.9.2 Analyze operational problems	✓	✓			
25.9.3 Install software upgrades or patches as needed	✓	✓			

Unit 26: System Administration and Control

Content Standard 26.1: Students analyze and perform general system administration tasks

BIL: Essential – ISS, NS **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS	I	R	P
NS	I	R	P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
26.1.1Facilitate the delivery of technical services	✓	✓			
26.1.2 Set up/maintain user accounts on multiple systems	✓	✓			
26.1.3 Prepare cost justifications	✓	✓			
26.1.4 Participate in evaluation of total system	✓	✓			
26.1.5 Demonstrate basic scripting skills as they relate to systems administration and control	✓	✓			

Content Standard 26.2: Students analyze and perform advanced system administration tasks

BIL: Recommended – ISS
RC:

EDU:	10	12	AD
ISS		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
26.2.1 Manage inventory and assets	✓				
26.2.2 Analyze historical data to identify trends	✓				
26.2.3 Prepare documentation manuals and required reports	✓				
26.2.4 Analyze future technology	✓				

Content Standard 26.3: Students implement control language programs to access system functions and database files

BIL: Recommended – ISS, PSD
RC:

EDU:	10	12	AD
ISS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
26.3.1 Explain the role of control language in relation to other languages	✓				
26.3.2 Access, procure, and test control language programs	✓				
26.3.3 Build forms using a layout editor	✓				
26.3.4 Integrate forms, reports, and graphics	✓				

Content Standard 26.4: Students integrate cross platform data exchange

BIL: Recommended – ISS, NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
26.4.1 Transfer files between cross-platform servers	✓				
26.4.2 Create web applications to perform file transfer	✓				
26.4.3 Run forms and reports on the web	✓				

Content Standard 26.5: Students store media

BIL: Recommended – ISS, PSD
RC:

EDU:	10	12	AD
ISS			P
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
26.5.1 Determine file and retrieval methods for stored media	✓				
26.5.2 Employ visual tool sets, languages, and libraries	✓				
26.5.3 Initialize/catalog media	✓				
26.5.4 Comply with company and/or government standards for media security	✓				
26.5.5 Maintain archives of company records as required by policy or law	✓				

Unit 27: Database Management System Basics

Content Standard 27.1: Students demonstrate knowledge of Database Management System (DBMS)

BIL: Essential – ISS, PSD, IM **Recommended** – NS
RC:

EDU:	10	12	AD
ISS		I	P
NS			I
PSD		I	P
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
27.1.1 Define terminology associated with relational databases	✓		✓	✓	
27.1.2 Identify the uses of a DBMS in business organizations	✓		✓	✓	
27.1.3 Utilize the features, functions, and architecture of a DBMS	✓		✓	✓	
27.1.4 Explain the organization of data in a DBMS	✓		✓	✓	
27.1.5 Use the transaction control techniques to ensure data integrity	✓		✓	✓	

Content Standard 27.2: Students apply data structure concepts to store and retrieve data

BIL: Essential – ISS, IM **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
27.2.1 Map data model to a relational model	✓		✓	✓	
27.2.2 Construct and implement logical files	✓		✓	✓	
27.2.3 Enter records into physical files	✓		✓	✓	

Content Standard 27.3: Students create database query

BIL: Essential – ISS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
27.3.1 Create a query to extract information from single and multiple files	✓		✓	✓	
27.3.2 Create nested queries	✓		✓	✓	
27.3.3 Create reports and/or files from queries	✓		✓	✓	

Content Standard 27.4: Students design and implement stored procedures

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I
IM			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
27.4.1 Explain procedural SQL extensions (e.g., SQL Server, Oracle, etc.)	✓		✓	✓	
27.4.2 Develop stored procedures within the DBMS	✓		✓	✓	
27.4.3 Execute and test stored procedures within the DBMS	✓		✓	✓	

Content Standard 27.5: Students deploy a DBMS

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD		I	P
IM			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
27.5.1 Distribute data across a distributed DBMS	✓		✓	✓	
27.5.2 Analyze/model organizations using Entity-Relationship and Object technologies	✓		✓	✓	
27.5.3 Identify the impact of networks on DBMS	✓		✓	✓	
27.5.4 Remove data anomalies through the process of normalization	✓		✓	✓	
27.5.5 Create/update a relational database using Structured Query Language	✓		✓	✓	
27.5.6 Query a relational database using Structured Query Language	✓		✓	✓	
27.5.7 Query data from an organizational repository using a database access facility	✓		✓	✓	
27.5.8 Perform database administration tasks	✓		✓	✓	

Content Standard 27.6: Students manage implementation of DBMS

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
27.6.1 Execute implementation plan according to project time line	✓		✓	✓	
27.6.2 Implement transition plan with minimal impact on productivity	✓		✓	✓	
27.6.3 Conduct user training	✓		✓	✓	
27.6.4 Define needed external informational resources (e.g., source, content, cost, and timeliness)	✓		✓	✓	
27.6.5 Access external information resources using Internet tools	✓		✓	✓	
27.6.6 Create/maintain a directory of external information resources	✓		✓	✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
27.6.7 Develop editors to facilitate data entry	✓		✓	✓	
27.6.8 Design simple reports for validating the performance of application systems	✓		✓	✓	
27.6.9 Apply software development principles, methods, and tools in implementing IS applications	✓		✓	✓	
27.6.10 Apply database design techniques to the implementation of a solution with calls from a program to the DBMS	✓		✓	✓	
27.6.11 Apply networking considerations in implementing distributed models	✓		✓	✓	
27.6.12 Develop server applications for installation and operation in a multi-user environment	✓		✓	✓	

Content Standard 27.7: Students monitor a DBMS

BIL: **Recommended** – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS			I
NS		I	
PSD			I
IM			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
27.7.1 Coordinate security requirements, including documentation functions	✓	✓	✓		
27.7.2 Identify desired levels of access and security	✓	✓	✓		
27.7.3 Communicate decisions concerning levels of access and security	✓	✓	✓		
27.7.4 Select monitoring tools and procedures	✓	✓	✓		
27.7.5 Identify monitoring methodologies	✓	✓	✓		
27.7.6 Identify problems in a timely fashion	✓	✓	✓		
27.7.7 Document problems	✓	✓	✓		
27.7.8 Propose solutions that are congruent with application requirements	✓	✓	✓		
27.7.9 Implement solutions to problems	✓	✓	✓		
27.7.10 Calibrate DBMS configuration parameters for optimum performance	✓	✓	✓		

Unit 28: Relational Database Design and Modeling

Content Standard 28.1: Students create databases for actual situations and business problems

BIL: **Essential –**ISS, IM **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS		I	P
PSD	I	P	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
28.1.1 Analyze database design using a workflow drawing or other requirement documents	✓		✓	✓	
28.1.2 Construct a database to solve a business problem or other real-life problem situation	✓		✓	✓	
28.1.3 Identify the relationship between database components	✓		✓	✓	

Content Standard 28.2: Students evaluate various data modeling techniques

BIL: **Essential –**ISS, IM **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS			I
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
28.2.1 Interpret terminology associated with data models	✓		✓	✓	
28.2.2 Compare/contrast various data models	✓		✓	✓	
28.2.3 Analyze data models	✓		✓	✓	
28.2.4 Develop a data model to describe an application's data	✓		✓	✓	

Content Standard 28.3: Students create conceptual data models

BIL: **Essential –**ISS, IM **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS		I	P
PSD	I	P	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
28.3.1 Analyze model requirements	✓		✓	✓	
28.3.2 Identify business entities and the relationships between them	✓		✓	✓	
28.3.3 Define data in an integrated data dictionary	✓		✓	✓	
28.3.4 Ensure that conceptual model includes tools to facilitate user access	✓		✓	✓	

Content Standard 28.4: Students validate conceptual data models

BIL: **Essential –** ISS, IM **Recommended** –PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
28.4.1 Present conceptual data model to client	✓		✓	✓	
28.4.2 Resolve issues with client	✓		✓	✓	
28.4.3 Secure client approval for model	✓		✓	✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
28.4.4 Feed recommendations back into the modeling process	✓		✓	✓	
28.4.5 Document validation process	✓		✓	✓	

Content Standard 28.5: Students integrate conceptual data models with enterprise models

BIL: Essential – ISS , IM **Recommended** –PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I
IM			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
28.5.1 Ensure that conceptual data model is consistent with enterprise model (e.g., entity names, relationships, and definitions)	✓		✓	✓	
28.5.2 Develop conceptual schema	✓		✓	✓	
28.5.3 Secure client approval for modifications in enterprise models	✓		✓	✓	

Content Standard 28.6: Students reconcile conceptual models with appropriate-level process models

BIL: Essential – ISS, IM **Recommended** –PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I
IM			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
28.6.1 Verify consistencies between models	✓		✓	✓	
28.6.2 Identify areas of overlap	✓		✓	✓	
28.6.3 Verify that data entities in process model have a corresponding entity data model	✓		✓	✓	
28.6.4 Document changes or modifications in either model	✓		✓	✓	

Content Standard 28.7: Students create logical data models

BIL: Essential – ISS**,** IM **Recommended** –PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I
IM			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
28.7.1 Map data model to a relational model	✓		✓	✓	
28.7.2 Identify attributes of model entities and relationships between them	✓		✓	✓	
28.7.3 Verify that logical model is consistent with conceptual model	✓		✓	✓	
28.7.4 Specify integrity constraints	✓		✓	✓	

Content Standard 28.8: Students specify unique identifiers (e.g. key)

BIL: Essential –ISS, IM **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS		I	R
PSD	I	R	P
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
28.8.1 Document identifiers	✓		✓	✓	
28.8.2 Identify rationale for selection of identifiers	✓		✓	✓	
28.8.3 Validate identifiers with client	✓		✓	✓	

Content Standard 28.9: Students normalize data models

BIL: Essential –ISS, IM **Recommended** – PSD
RC:

EDU:	10	12	AD
ISS			I
PSD	I	R	R
IM		I	IR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
28.9.1 Normalize logical data model in accordance with established company policy	✓		✓	✓	
28.9.2 Verify that data model matches specifications	✓		✓	✓	
28.9.3 Validate logical data model with client	✓		✓	✓	

Content Standard 28.10: Students reconcile conceptual models with lower process models

BIL: Essential – ISS, IM **Recommended** –PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I
IM			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
28.10.1 Verify consistencies between models	✓		✓	✓	
28.10.2 Identify areas of overlap	✓		✓	✓	
28.10.3 Verify that data entities in process model have a corresponding entity data model	✓		✓	✓	
28.10.4 Document changes or modifications in either model	✓		✓	✓	
28.10.5 Integrate logical data model with enterprise model	✓		✓	✓	

Unit 29.: Database Administration

Content Standard 29.1: Students determine environment/platform for physical database structures and software

BIL: **Recommended –** ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS			I
NS		I	R
PSD			I
IM			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
29.1.1 Research potential computer environments/platforms	✓	✓	✓		
29.1.2 Identify platform capabilities and limitations	✓	✓	✓		
29.1.3 Select environment/platform based on technical, business, and skill information gathered	✓	✓	✓		
29.1.4 Secure approval of target environment/platform	✓	✓	✓		

Content Standard 29.2: Students identify backup and recovery requirements for physical database

BIL: **Essential –** ISS, NS **Recommended –** PSD, IM
RC:

EDU:	10	12	AD
ISS			P
NS		P	R
PSD			I
IM			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
29.2.1 Establish backup requirements consistent with corporate policy and business needs	✓	✓			
29.2.2 Document established backup procedures	✓	✓			
29.2.3 Control access to database to maintain security	✓	✓			
29.2.4 Identify means to control access to backup	✓	✓			

Content Standard 29.3: Students identify and integrate database access requirements

BIL: **Recommended –** ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
NS			I
PSD	I	R	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
29.3.1 Identify inputs, output, and volume of every user view (GUI)	✓				
29.3.2 Categorize user views by type of transaction	✓				
29.3.3 Document access to data by type of access	✓				
29.3.4 Integrate access requirements with backup and recovery plan	✓				

Content Standard 29.4: Students identify physical database characteristics

BIL: Essential – IM **Recommended –** ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD		I	R
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
29.4.1 Identify name, type, and length of attributes	✓			✓	
29.4.2 Employ table and file names that conform to naming conventions	✓			✓	
29.4.3 Group/assign tables to disk files	✓			✓	
29.4.4 Index files for performance and integrity	✓			✓	
29.4.5 Verify that data types are consistent between attributes	✓			✓	
29.4.6 Employ normalization and modeling as cross-checking techniques	✓			✓	

Content Standard 29.5: Students reconcile physical design with processing requirements

BIL: Recommended – ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
29.5.1 Resolve conflicts between physical model and process model	✓				
29.5.2 Verify that data entities in process model have a corresponding entity data model	✓				
29.5.3 Document changes made to either model	✓				

Unit 30: Data Warehousing

Note: Unit 29 is a prerequisite for Unit 35.

Content Standard 30.1: Students demonstrate knowledge of basic data warehousing concepts

BIL: **Recommended** – ISS, NS, PSD
RC:

EDU:	10	12	AD
ISS			I
NS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
30.1.1 Differentiate between traditional databases and data warehouses	✓				
30.1.2 Recognize importance of data warehouses and integration	✓				
30.1.3 Recognize that information is a competitive resource	✓				
30.1.4 Identify components of data warehouses (e.g., subject-oriented, integrated, time-variant, nonvolatile)	✓				
30.1.5 Identify the characteristics and uses of metadata	✓				
30.1.6 Define types of information (e.g., associations, sequences, classifications, clusters, and forecasting)	✓				
30.1.7 Utilize data conversion techniques and functions	✓				
30.1.8 Identify types of programs and applications for data warehousing	✓				
30.1.9 Identify types of data mining tools (i.e., neural networks, decision trees, rule induction, and data visualization)	✓				
30.1.10 Define public summary data	✓				

Content Standard 30.2: Students apply ethical behaviors to data warehousing

BIL: **Recommended** – ISS, NS, PSD
RC:

EDU:	10	12	AD
ISS			I
NS			I
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
30.2.1 Define appropriate security measures	✓				
30.2.2 Describe the limitations of external data	✓				
30.2.3 Identify ethical uses of data	✓				
30.2.4 Define use of permanent detail data for legal or ethical purposes	✓				

Content Standard 30.3: Students perform data entry and updating

BIL: **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			
PSD			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
30.3.1 Develop an entity-relationship diagram	✓		✓		
30.3.2 Employ appropriate index or indices	✓		✓		
30.3.3 Define data repositories	✓		✓		
30.3.4 Design metamodel	✓		✓		
30.3.5 Apply appropriate security measures	✓		✓		

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
30.3.6 Differentiate between permanent detail data and regular data	✓		✓		
30.3.7 Apply skill in working with data programs	✓		✓		
30.3.8 Maintain metadata	✓		✓		
30.3.9 Size data warehouse	✓		✓		
30.3.10 Load/transfer data (map data)	✓		✓		
30.3.11 Scrub/filter data	✓		✓		

Content Standard 30.4: Students perform data retrieval

BIL: **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			
PSD			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
30.4.1 Locate appropriate data warehouses	✓		✓		
30.4.2 Perform strategic analyses using a multidimensional database	✓		✓		
30.4.3 Secure necessary indices	✓		✓		
30.4.4 Design reasonable query	✓		✓		
30.4.5 Define nature of application	✓		✓		
30.4.6 Apply appropriate security measures	✓		✓		
30.4.7 Obtain necessary responses from data query	✓		✓		
30.4.8 Calculate derived and aggregate data	✓		✓		
30.4.9 Validate the processing of data	✓		✓		

Content Standard 30.5: Students apply data

BIL: **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			
PSD			I

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
30.5.1 Optimize query procedures	✓		✓		
30.5.2 Evaluate information gathered in query	✓		✓		
30.5.3 Utilize public summary data	✓		✓		
30.5.4 Design reporting medium	✓		✓		
30.5.5 Perform online analytical processing	✓		✓		
30.5.6 Construct report from data gathered	✓		✓		

Unit 31: Web Site Development and Management

Content Standard 31.1: Students demonstrate knowledge of XHTML fundamentals

BIL: Essential –PSD, IM
RC:

EDU:	10	12	AD
PSD	I	IR	IR
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
31.1.1 Create a basic XHTML document that includes graphics and multimedia			✓	✓	
31.1.2 Link Web documents			✓	✓	
31.1.3 Utilize forms in an XHTML document			✓	✓	
31.1.4 Create and format a table on an XHTML document			✓	✓	

Content Standard 31.2: Students develop a Web site

BIL: Essential –PSD, IM
RC:

EDU:	10	12	AD
PSD	I	IR	R
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
31.2.1 Use documentation standards to record design and development decisions			✓	✓	
31.2.2 Integrate scripting into an XHTML document			✓	✓	
31.2.3 Employ object oriented techniques in web development			✓	✓	
31.2.4 Utilize data storage techniques in web development			✓	✓	
31.2.5 Employ control structures in web development (e.g., naming schemes, content hierarchies)			✓	✓	
31.2.6 Create and call functions and procedures in web development			✓	✓	

Content Standard 31.3: Students demonstrate knowledge of content management

BIL: Essential – PSD, IM
RC:

EDU:	10	12	AD
PSD	I	IR	R
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
31.3.1 Test site/application after content is updated to ensure integrity			✓	✓	
31.3.2 Perform updates in a timely manner			✓	✓	
31.3.3 Perform updates in accordance with application requirements			✓	✓	
31.3.4 Update content only on appropriate pages in relevant objects of the database			✓	✓	
31.3.5 Update and review links			✓	✓	
31.3.6 Utilize appropriate tools to identify and update content			✓	✓	
31.3.7 Backup site/application and data before performing updates			✓	✓	
31.3.8 Log all update activities			✓	✓	

Content Standard 31.4: Students support web application management

BIL: Essential – PSD, IM
RC:

EDU:	10	12	AD
PSD		I	P
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
31.4.1 Plan rollout and facilitate handoff to customer				✓	
31.4.2 Integrate customer feedback				✓	
31.4.3 Perform application maintenance				✓	
31.4.4 Recommend optimization and facilitate upgrades and improvement				✓	
31.4.5 Monitor Web site performance metrics				✓	

Content Standard 31.5: Students integrate scripting into XHTML document

BIL: Essential –PSD, IM **Recommended** – NS
RC:

EDU:	10	12	AD
NS			I
PSD		I	IR
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
31.5.1 Explain the concept of scripting technologies			✓	✓	
31.5.2 Identify scripting languages (e.g. Java script, VB script, and ActionScript)			✓	✓	
31.5.3 Explain client-side scripting			✓	✓	
31.5.4 Construct and insert a client-side script into a Web page			✓	✓	
31.5.5 Construct and insert comments into client-side script			✓	✓	
31.5.6 Explain server-side script			✓	✓	
31.5.7 Compare and contrast the server-side script to client-side script			✓	✓	
31.5.8 Identify "server page" development technologies (e.g. JSP, ASP)			✓	✓	
31.5.9 Construct and insert server-side script into a Web page			✓	✓	
31.5.10 Construct and insert comments into server-side scripts			✓	✓	
31.5.11 Develop criteria for selecting server-side or client side script given a Web page development task			✓	✓	

Unit 32: Web Site Development and Management— XHTML Fundamentals

Content Standard 32.1: Students create a basic XHTML document

BIL: Essential –IM **Recommended** – ISS, NS
RC:

EDU:	10	12	AD
ISS	I		
NS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
32.1.1 Explain the need for developers to create and maintain XHTML script when utilizing web document authoring tools				✓	
32.1.2 Discuss the basic principles of XHTML, HTTP, HTTPS, and TCP/IP and their functional relationship with browsers				✓	
32.1.3 Plan a basic XHTML document considering subject, audience, layout, color, links and graphics				✓	
32.1.4 Create meta-data				✓	
32.1.5 Utilize XHTML tags that display and format web content to create a basic web page in a text editor				✓	
32.1.6 Add comments to the XHTML document				✓	
32.1.7 Print XHTML code				✓	
32.1.8 Display a basic web page created in a text editor on a browser				✓	
32.1.9 Evaluate functionality and features of downloadable XHTML freeware authoring IDE's to create basic web sites (e.g. Homesite, CuteXHTML)				✓	
32.1.10 Create and add unordered lists				✓	
32.1.11 Create and add ordered lists				✓	

Content Standard 32.2: Students create a basic template

BIL: Essential –IM **Recommended** – ISS, NS
RC:

EDU:	10	12	AD
ISS	I		
NS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
32.2.1 Compare and contrast the advantages and disadvantages of a template				✓	
32.2.2 Understand and define the components of a template (library, editable region, repeating table, etc.)				✓	
32.2.3 Plan and create a basic template				✓	
32.2.4 Apply template to web site				✓	

Content Standard 32.3: Students demonstrate knowledge of graphics and multimedia

BIL: **Essential –**IM **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS		I	
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
32.3.1 Insert and align inline graphics				✓	
32.3.2 Use XHTML tags to describe multimedia				✓	
32.3.3 Demonstrate how to resize a graphic using the appropriate tool				✓	
32.3.4 Explain the concept of an image map				✓	
32.3.5 Locate downloadable freeware that generates an image map (e.g. MapThis, MapIt)				✓	
32.3.6 Create an image map for a graphic utilizing image map generation				✓	
32.3.7 Demonstrate how to insert and play an audio file				✓	

Content Standard 32.4: Students link web documents

BIL: **Essential –**IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS	I	R	R
PSD	I		
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
32.4.1 Understand and demonstrate absolute and relative linking to other documents (PDF, XHTML, DOC, XLS, E-mail, etc.)				✓	
32.4.2 Write an XHTML anchor code that links to another location within the document and/or site				✓	
32.4.3 Link one web page to another by clicking a graphic image				✓	

Content Standard 32.5: Students utilize forms in an XHTML document

BIL: **Essential –**IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS	I	R	R
PSD	I		
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
32.5.1 Discuss the concept of a form on a web document and the various tags that can be contained within the form (e.g. text entry fields, radio buttons, submit button)				✓	
32.5.2 Design a basic form from given specifications, utilizing a variety of input controls (e.g. text entry fields, radio buttons)				✓	
32.5.3 Write the code to add a form to an XHTML document				✓	
32.5.4 Write the code for a text entry field				✓	
32.5.5 Write the code for radio buttons				✓	
32.5.6 Write the code for a check box button(s)				✓	
32.5.7 Write the code for a pull-down menu				✓	
32.5.8 Write the code for a scroll box				✓	
32.5.9 Write the code for a pull-down menu				✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
32.5.10 Write the code for a submit button				✓	
32.5.11 Code selected default values for all input tags				✓	

Content Standard 32.6: Students create and format a table on an XHTML document

BIL: Essential –IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	
PSD	I		
IM	I	P	PR

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
32.6.1 Write the XHTML code to insert a table				✓	
32.6.2 Discuss the concept of table sizing on an XHTML document				✓	
32.6.3 Modify a row to span several columns by utilizing the ROWSPAN attribute				✓	
32.6.4 Modify a column by merging it with adjacent cells with the COLSPAN attribute				✓	
32.6.5 Modify a row by merging it with adjacent cells with the ROWSPAN attribute				✓	
32.6.6 Apply border attributes to a table (i.e., color, size, style, etc.)				✓	
32.6.7 Align text in a table utilizing the ALIGN = attribute				✓	
32.6.8 Add color to table rows utilizing the BGCOLOR= attribute				✓	
32.6.9 Control the dimensions of a table by utilizing the CELLPADDING= and WIDTH= table attributes				✓	

Unit 33: Web Site Development—Content Development and Technical Analysis

Content Standard 33.1: Students gather data and identify client requirements and scope of work

BIL: Essential –IM
RC:

EDU:	10	12	AD
IM	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.1.1 Define audience and mission in accordance with client procedures				✓	
33.1.2 Utilize affordable, reliable and relevant sources and methods for gathering requirements				✓	
33.1.3 Specify requirements and scope of work assuring they are accurate, complete, documented, updated on a regular basis and stored in an accessible and readable knowledge base for future reference				✓	
33.1.4 Analyze data security and privacy requirements				✓	
33.1.5 Analyze end user needs and constraints				✓	
33.1.6 Gather information regarding global considerations (e.g. time zones, language, cultural sensitivities)				✓	

Content Standard 33.2: Students review technical information and restraints

BIL: Essential –IM
RC:

EDU:	10	12	AD
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.2.1 Consider technical factors (e.g., server load, screen resolution, hard drive space, bandwidth, database performance, etc)				✓	
33.2.2 Consider and address feasibility, usability, extensibility, accessibility and maintenance issues				✓	
33.2.3 Assess budget and equipment constraints and approvals				✓	
33.2.4 Research and compare software tools as to the effectiveness for the work to be done and ability to integrate into the existing organization system				✓	
33.2.5 Research and consider accessibility laws, privacy laws, and regulatory issues				✓	
33.2.6 Assess implementation risk and communicate to appropriate personnel				✓	
33.2.7 Research and address system performance and availability requirements				✓	

Content Standard 33.3: Students demonstrate knowledge of usability and interface design

BIL: Essential –IM
RC:

EDU:	10	12	AD
IM	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.3.1 Discuss ADA section 508 compliancy requirements				✓	
33.3.2 Discuss assistance devices and their interface with web pages				✓	
33.3.3 Identify the fundamentals of interface design (e.g., usability, navigation, use of color, functionality, etc.)				✓	
33.3.4 Use structured approaches to develop text content				✓	
33.3.5 Examine psychological and cultural implications				✓	

Content Standard 33.4: Students apply knowledge of web hosting

BIL: Essential –IM **Recommended** – ISS, NS
RC:

EDU:	10	12	AD
IS			I
NS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.4.1 Compare the advantages and disadvantages of running your own server vs. using a server provider				✓	
33.4.2 Identify hardware requirements for a server				✓	
33.4.3 Identify server software options and security implications				✓	
33.4.4 Demonstrate the process of ordering a domain name				✓	
33.4.5 Evaluate hosting providers (i.e., size, legitimacy, security, bandwidth allocation, etc.)				✓	
33.4.6 Explain how to assign a domain name to a DNS server				✓	
33.4.7 Comply with TCP/IP (Transfer Control Protocol/Internet Protocol)				✓	
33.4.8 Upload files to the server using secure ftp				✓	
33.4.9 Publicize the site (e.g., optimize search engine placement)				✓	
33.4.10 Collect/analyze usage statistics				✓	

Content Standard 33.5: Students develop, present, and assess concept alternatives

BIL: Essential –IM
RC:

EDU:	10	12	AD
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.5.1 Present an appropriate number of concepts to all relevant stakeholders				✓	
33.5.2 Consider and document concept alternatives				✓	
33.5.3 Select appropriate concept				✓	

Content Standard 33.6: Students prepare preliminary design

BIL: Essential –IM
RC:

EDU:	10	12	AD
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.6.1 Organize content information in order to meet concept objectives				✓	
33.6.2 Gather a consensus among all stakeholders regarding the organization of information				✓	
33.6.3 Follow company guidelines and practices in implementation of the concept design				✓	

Content Standard 33.7: Students prepare functional, content, testing, and technical specifications

BIL: Essential –IM
RC:

EDU:	10	12	AD
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.7.1 Prepare functional, content, testing and technical specifications in a clear and precise manner to include detail on all product features				✓	
33.7.2 Prepare data security and privacy requirements				✓	
33.7.3 Publish and regularly update functional, content, testing and technical specifications				✓	
33.7.4 Integrate client and end-user needs into technical specifications				✓	
33.7.5 Describe software, communication protocols and programming languages in technical specifications				✓	

Content Standard 33.8: Students create and refine preliminary design or prototype

BIL: Essential –IM
RC:

EDU:	10	12	AD
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.8.1 Implement all required design features in a prototype				✓	
33.8.2 Include representative functional features in a prototype				✓	
33.8.3 Review and refine the prototype based on client feedback, new information and technical considerations				✓	
33.8.4 Evaluate the effectiveness of the software tools chosen for the project in the prototype				✓	
33.8.5 Complete prototype on schedule				✓	

Content Standard 33.9: Students develop project plan

BIL: Essential –IM
RC:

EDU:	10	12	AD
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
33.9.1 Identify key stakeholder requirements in the project plan				✓	
33.9.2 Develop a time line to include project schedules, resource allocations, dependencies, milestones, functional and technical specifications, all data models, site maps, constraints and risks in the project plan				✓	
33.9.3 Include thorough testing of the solution and presentation of testing results in the project plan				✓	
33.9.4 Include all specifications in the project plan				✓	
33.9.5 Determine how documentation will be conducted in the project plan				✓	
33.9.6 Document and regularly update the project plan throughout the project life cycle in a previously determined format				✓	
33.9.7 Distribute project plan according to company procedures				✓	

Unit 34: Web Site Development—Develop Web Sites

Based on NSSB Information & Communications Technology Skill Standards

Content Standard 34.1: Students develop web site architecture, prototypes, and user interface specifications

BIL: Recommended –IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
34.1.1 Develop consensus among all relevant key stakeholders regarding the organization of information and the look and feel of the end product				✓	
34.1.2 Develop system interactions and sequence diagrams				✓	
34.1.3 Develop site map, application models, image and page templates to meet project goals, user needs and application objectives				✓	
34.1.4 Develop site maps and application models in accordance with company standards and industry best practices				✓	
34.1.5 Review existing documentation				✓	
34.1.6 Employ file management procedures in accordance with organization protocols				✓	
34.1.7 Obtain approvals on final site map prior to implementing any design				✓	

Content Standard 34.2: Students write supporting code and implement appropriate testing

BIL: Recommended –IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
34.2.1 Write code that meets project objectives, functional specifications, best practices and in-house coding guidelines				✓	
34.2.2 Write code that promotes efficient application performance and is easily maintained and debugged				✓	
34.2.3 Document code to ensure maintainability and upgradeability				✓	
34.2.4 Test and document code in accordance with company procedures				✓	
34.2.5 Test and document user interface usability				✓	
34.2.6 Analyze and resolve any errors in a timely and cost-effective manner				✓	
34.2.7 Construct large scale test scenarios				✓	

Content Standard 34.3: Students analyze major subsystems and interfaces

BIL: Recommended –IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
34.3.1 Define and delineate all major subsystems and interfaces				✓	
34.3.2 Minimize overlap and interaction between major subsystems				✓	
34.3.3 Test for compatibility of application subsystems and interfaces				✓	
34.3.4 Document major subsystems and interfaces				✓	
34.3.5 Document interactions with subsystems and interfaces				✓	

Content Standard 34.4: Students develop models

BIL: Recommended –IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
34.4.1 Define scope and purpose of models				✓	
34.4.2 Develop models that are cost-effective and completed on schedule				✓	
34.4.3 Develop models that are representative of design and functionality				✓	
34.4.4 Exercise models and test for performance				✓	
34.4.5 Document-model development procedures, test results and recommendations				✓	
34.4.6 Develop models to reflect all aspects of the project including the business, interface and data				✓	

Content Standard 34.5: Students develop design and interface specifications

BIL: Recommended –IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
34.5.1 Seek approval of design and interface specifications by all relevant parties				✓	
34.5.2 Check and correct design and interface specifications for conflicts				✓	
34.5.3 Assess design and interface specifications for ease and quality of implementation				✓	
34.5.4 Document design and interface specifications				✓	
34.5.5 Develop and diagram entity relationships				✓	

Content Standard 34.6: Students identify system platform components and dependencies

BIL: Recommended –IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
34.6.1 Clearly delineate system platform components and dependencies				✓	
34.6.2 Document reasons for constraints				✓	
34.6.3 Delineate all components and interfaces to ensure a minimum of overlap and interaction between components				✓	
34.6.4 Identify and document long term usability and future upgrade requirements				✓	

Content Standard 34.7: Students develop interactivity with supporting database

BIL: Recommended –IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
34.7.1 Write code for Web site to interact with associated databases				✓	
34.7.2 Develop protocols in accordance with company procedures				✓	
34.7.3 Assist database developers in meeting project specifications				✓	
34.7.4 Develop database functionality to meet project specifications				✓	
34.7.5 Utilize fundamental database concepts				✓	

Unit 35: Interactive Multimedia Production

Content Standard 35.1: Students demonstrate knowledge of interactive media

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	R
PSD		I	R
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.1.1 Define interactive media components				✓	
35.1.2 Identify the major characteristics of interactive media presentations				✓	
35.1.3 Identify the important historical developments leading to contemporary interactive media				✓	
35.1.4 Identify various interactive media industry genres				✓	
35.1.5 Perform critical review of various interactive media end products				✓	
35.1.6 Identify rights, responsibilities, and controls related to various interactive media				✓	
35.1.7 Interpret intellectual property laws relative to interactive media				✓	
35.1.8 Analyze the social and cultural implications of interactive media				✓	
35.1.9 Identify key criticisms of interactive media				✓	
35.1.10 Identify possible applications for interactive media (e.g., sales and marketing, interactive advertising, K-12 education, corporate training, corporate communications, distance learning, news, entertainment)				✓	
35.1.11 Identify specific uses of interactive media in each potential market				✓	
35.1.12 Identify future trends in interactive media				✓	

Content Standard 35.2: Students produce interactive media as a member of a development team

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	R
PSD			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.2.1 Define the role of individual team members				✓	
35.2.2 Select appropriate hardware tools				✓	
35.2.3 Select appropriate software tools				✓	
35.2.4 Select the media elements (e.g., sound, video, graphics, text, animation) to be used				✓	
35.2.5 Integrate media elements				✓	
35.2.6 Select the publication process to be used				✓	
35.2.7 Select the distribution method to be used				✓	
35.2.8 Explain decisions made (e.g., inputs and outputs)				✓	
35.2.9 Develop a conceptual model for the interactive media project				✓	

Content Standard 35.3: Students develop project concept proposal

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	R
PSD			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.3.1 Determine purpose of the interactive media project				✓	
35.3.2 Determine client needs and expected outcomes				✓	
35.3.3 Determine the target audience				✓	
35.3.4 Determine objectives				✓	
35.3.5 Research the content				✓	
35.3.6 Develop a design brief				✓	
35.3.7 Select appropriate message design (e.g., instructional, informational, entertainment)				✓	
35.3.8 Determine the setting where the message will be used				✓	
35.3.9 Determine the interactive media elements to be used				✓	
35.3.10 Determine degree of interactivity desired				✓	
35.3.11 Identify available media and content sources				✓	
35.3.12 Decide whether to produce or acquire content (graphics, animation, audio, video, simulations, virtual environments, copyrights)				✓	
35.3.13 Develop time line, task breakdown, and responsibilities for completion				✓	
35.3.14 Develop project budget				✓	
35.3.15 Write proposal				✓	
35.3.16 Obtain client approval throughout project				✓	

Content Standard 35.4: Students develop navigational structures

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.4.1 Identify types of navigational menu structures (e.g., rollovers, drop-downs, disjointed)				✓	
35.4.2 Determine placement of navigational units				✓	
35.4.3 Construct and place navigational units				✓	
35.4.4 Developing logic/site maps				✓	

Content Standard 35.5: Students develop scripts, storyboards, and flowcharts used in interactive media

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	R
PSD		I	R
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.5.1 Determine uses and need for scripts, storyboards and flow charts				✓	
35.5.2 Make preliminary sketches showing placement of images and text on screen				✓	
35.5.3 Show placement of buttons/navigational graphics				✓	
35.5.4 Provide information on color schemes				✓	
35.5.5 Describe music to be used				✓	
35.5.6 Describe video (still and motion)				✓	
35.5.7 Describe special effects (video and audio)				✓	
35.5.8 Provide a sample layout				✓	

Content Standard 35.6: Students combine media elements to produce an interactive multimedia

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS		I	
PSD		I	
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.6.1 Apply visual design skills				✓	
35.6.2 Generate text for multi-image presentations (e.g., title graphics, charts, graphs)				✓	
35.6.3 Create 2-D computer graphics				✓	
35.6.4 Create 3-D computer graphics				✓	
35.6.5 Create computer animation				✓	
35.6.6 Prepare photographic images for interactive media				✓	
35.6.7 Alter images using an image manipulation program				✓	
35.6.8 Integrate photographically derived images with hand-drawn graphic images				✓	
35.6.9 Integrate the use of photographic special effects into interactive media presentations				✓	
35.6.10 Acquire talent, if necessary				✓	
35.6.11 Coordinate work with the acquired talent				✓	
35.6.12 Create/acquire video footage				✓	
35.6.13 Digitize/edit video footage using computer video-editing software				✓	
35.6.14 Record/acquire sound track, including narration, voice-overs, sound effects, and music				✓	
35.6.15 Integrate sound with visuals				✓	
35.6.16 Build in hotspots and interactive links				✓	
35.6.17 Synthesize available interactive media technologies into a unified presentation/product using software and hardware tools				✓	
35.6.18 Test product				✓	
35.6.19 Debug product				✓	
35.6.20 Maintain/update product				✓	

Content Standard 35.7: Students explain the types and uses of interactive media applications

BIL: **Essential** – IM **Recommended** – ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD		I	R
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.7.1 Describe an interactive media presentation (e.g., web-based, local)				✓	
35.7.2 Define *kiosks* and their uses				✓	
35.7.3 Define video conferences and their uses				✓	
35.7.4 Identify the characteristics of gaming and simulations				✓	
35.7.5 Analyze interactive communities (e.g. gaming, interpersonal, auctions, support groups, etc.) and their functions in society				✓	
35.7.6 Define mobile applications and their uses				✓	
35.7.7 Identify emerging applications and their uses				✓	

Content Standard 35.8: Students demonstrate knowledge of developing a training product

BIL: **Essential** – ISS, IM
RC:

EDU:	10	12	AD
ISS		I	P
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.8.1 Differentiate between training needs and development needs	✓			✓	
35.8.2 Identify the major characteristics of learner audiences (adults, adolescents, etc.)	✓			✓	
35.8.3 Identify methods of product delivery (e.g., Internet, CD-ROM, Audio/Video)	✓			✓	

Content Standard 35.9: Students develop a training product

BIL: **Essential** – IM **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.9.1 Analyze the audience				✓	
35.9.2 Identify learner needs				✓	
35.9.3 Develop training objectives				✓	
35.9.4 Employ sound instructional design principles				✓	
35.9.5 Employ a variety of media in presenting training				✓	
35.9.6 Evaluate training effectiveness				✓	

Content Standard 35.10: Students maintain interactive media equipment

BIL: **Essential** – IM **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.10.1 Demonstrate proper care and handling procedures for interactive media equipment				✓	
35.10.2 Perform pre-and post-production routines for presentations				✓	
35.10.3 Analyze equipment performance against industry standards				✓	
35.10.4 Troubleshoot simple equipment problems				✓	

Content Standard 35.11: Students assess interactive media career opportunities

BIL: **Essential** – IM **Recommended** – ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.11.1 Identify potential career areas in interactive media				✓	
35.11.2 Identify education/training needs (e.g., degree, non-degree, certificates, and certification)				✓	
35.11.3 Initiate portfolio				✓	

Content Standard 35.12: Students utilize the basic principles of 2-D animation.

BIL: **Essential** – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.12.1 Explain the principles of continuity, key frames, motion paths, and motion (e.g., shape tweening, path tweening, motion tweening)				✓	
35.12.2 Identify appropriate use of scenes				✓	
35.12.3 Create special effects and virtual navigation				✓	
35.12.4 Identify available animation software programs/tools				✓	
35.12.5 Create 2-D sprite animation				✓	
35.12.6 Discuss the principles of cell animation				✓	
35.12.7 Explain timelines, key frames, and objects in animation				✓	

Content Standard 35.13: Students utilize the basic principles of 3-D animation.

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
35.13.1 Create and render 3-D animation				✓	
35.13.2 Create real-time Virtual Reality Mark-up Language (VRML) 3-D animation				✓	

Unit 36: Multimedia Development—Performance Testing and Quality Assurance

Content Standard 36.1: Students develop an acceptable plan

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
36.1.1 Create a written procedure agreed by the customer and the project team for determining the acceptability of the project deliverables				✓	
36.1.2 Develop test and acceptance plan that is completed and documented in accordance with applicable policies and baseline tests				✓	
36.1.3 Develop a test plan that is relevant to the application and assure requirements are in compliance with legal and customer requirements				✓	
36.1.4 Develop a test system that accurately mimics external interfaces				✓	
36.1.5 Develop realistic test cases that compare with expected performance and include all browser and device types				✓	
36.1.6 Identify testing resources and establish a schedule				✓	
36.1.7 Seek customer acceptance upon successful completion of the test plan				✓	

Content Standard 36.2: Students develop test procedures and performance assessment requirements

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
36.2.1 Develop test procedures that explicitly verify specifications				✓	
36.2.2 Develop test procedures that define test conditions				✓	
36.2.3 Document testing procedures				✓	
36.2.4 Develop appropriate tests for individual components and end-to-end operations				✓	

Content Standard 36.3: Students develop and perform usability and testing integration

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
36.3.1 Provide individuals from the representative user community opportunities to interact with product				✓	
36.3.2 Observe and document user while using the product				✓	
36.3.3 Convey information of usability test to development team/ or have development team attend usability testing sessions				✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
36.3.4 Resolve any problems that are indicated from usability test results				✓	
36.3.5 Maintain test data and documentation over time for accessibility to the development team				✓	
36.3.6 Describe test routines and procedures for applicability efficiency				✓	
36.3.7 Identify appropriate metrics for the tests based on user task analysis findings				✓	
36.3.8 Repeat usability testing as necessary after product revisions				✓	

Content Standard 36.4: Students create performance tests process

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
36.4.1 Identify appropriate team members in test process				✓	
36.4.2 Test system according to plan and schedule				✓	
36.4.3 Document test results and communicate as appropriate				✓	
36.4.4 Perform system integration testing and volume/performance testing when appropriate				✓	
36.4.5 Repeat testing after all major program modifications				✓	

Content Standard 36.5: Students recommend and implement performance improvement

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
36.5.1 Codify and analyze performance metrics for effective decision support				✓	
36.5.2 Actively solicit customer feedback to be maintained and applied to performance reviews				✓	
36.5.3 Prepare application improvement plans based on performance reviews and business goals				✓	
36.5.4 Compare performance analysis to previous tests after implementing performance improvements				✓	

Content Standard 36.6: Students provide quality customer service

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
36.6.1 Manage customer relationship and communications so that customers are satisfied with current level of service				✓	
36.6.2 Meet internal, external and global customer expectations in a timely manner				✓	
36.6.3 Identify problems and refer to appropriate personnel in a timely manner				✓	
36.6.4 Adjust communications to fit the audience				✓	
36.6.5 Evaluate customer feedback to determine the source of any confusion or concerns				✓	
36.6.6 Address and resolve customer concerns concerning site/applications to avoid repeated complaints				✓	
36.6.7 Communicate clearly customer service contact information to customers in a timely manner				✓	

Unit 37: 3-D Design

Content Standard 37.1: Students demonstrate knowledge of the basic principles of 3-D modeling.

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
37.1.1 Explain how to convert objects from two-dimensional to three-dimensional				✓	
37.1.2 Explain how a computer deals with geometry (e.g., algorithms, vector)				✓	
37.1.3 Identify the software available for 3-D modeling				✓	
37.1.4 Explain the steps for building a 3-D model				✓	
37.1.5 Define the components of a wireframe model				✓	

Content Standard 37.2: Students create 3-D models.

BIL: Recommended –ISS, IM
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
37.2.1 Create a model using 3-D modeling software				✓	
37.2.2 Determine desired camera angle				✓	
37.2.3 Adjust lighting angle, focus, and color to achieve desired effect				✓	
37.2.4 Adjust surface color, texture, transparency, and reflectivity to achieve desired effect				✓	
37.2.5 Compare/contrast flat shading, curved shading, ray tracing, and radiosity methods				✓	
37.2.6 Render the object using flat shading				✓	
37.2.7 Render the object using curved shading				✓	
37.2.8 Render the object using ray tracing				✓	
37.2.9 Combine models to create a scene				✓	
37.2.10 Render the completed scene				✓	

Content Standard 37.3: Students perform advanced 3-D image generation techniques.

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
37.3.1 Follow basic animation principles				✓	
37.3.2 Perform basic texture-mapping algorithms				✓	
37.3.3 Perform basic antialiasing				✓	
37.3.4 Perform basic volume-rendering algorithms				✓	
37.3.5 Develop basic curves and surfaces				✓	
37.3.6 Perform surface detail modeling				✓	

Content Standard 37.4: Students utilize the basic principles of 3-D animation.

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
37.4.1 Create and render 3-D animation				✓	
37.4.2 Create real-time Virtual Reality Mark-up Language (VRML) 3-D animation				✓	

Content Standard 37.5: Students develop animated characters.

BIL: Recommended –ISS, IM
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
37.5.1 Design a character based on a narrative context				✓	
37.5.2 Develop characters in accordance with designs				✓	
37.5.3 Animate a character so as to express its nature				✓	
37.5.4 Capture motion				✓	
37.5.5 Design 2-D characters				✓	
37.5.6 Design 3-D models of characters				✓	

Content Standard 37.6: Students create 3-D environments.

BIL: Recommended –ISS, IM
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
37.6.1 Create buildings and rooms				✓	
37.6.2 Import buildings and rooms				✓	
37.6.3 Create land forms				✓	
37.6.4 Import land forms				✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
37.6.5 Create bodies of water (e.g., lakes, rivers, oceans, waterfalls)				✓	
37.6.6 Create basic water textures, reflections, refractions, and splashing				✓	
37.6.7 Incorporate fog and background images				✓	
37.6.8 Manipulate particle systems such as rain and snow				✓	
37.6.9 Apply lighting effects				✓	
37.6.10 Add special effects				✓	
37.6.11 Code object intelligence into a 3-D environment				✓	

Content Standard 37.7: Students demonstrate knowledge of virtual environment.

BIL: Recommended –ISS, IM
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
37.7.1 Explain the basic principles of virtual environment				✓	
37.7.2 Explain the principles of geometry relative to virtual environment				✓	
37.7.3 Differentiate virtual environment file formats (e.g., QTVR, IPIX)				✓	
37.7.4 Manage polygon resources				✓	
37.7.5 Create a basic virtual environment				✓	

Unit 38: Appreciation of the Arts as it Applies to Information Technology

Content Standard 38.1: Students demonstrate knowledge of and an appreciation for music

BIL: **Essential –** IM **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
38.1.1 Compare/contrast the role of music in different historical periods				✓	
38.1.2 Assess the role of music in contemporary living				✓	
38.1.3 Compare/contrast the function of music in different cultures				✓	
38.1.4 Distinguish the basic physical properties of sound (e.g., pitch, intensity, duration, and timbre)				✓	
38.1.5 Distinguish the various elements of music (e.g., rhythm, melody, harmony, tone, color, and form)				✓	
38.1.6 Identify how musical elements relate to the meaning or content of a composition				✓	
38.1.7 Identify the feelings conveyed by various musical elements (e.g., thematic construction, tonal color, instruments, texture, volume, and tempo)				✓	
38.1.8 Discuss how music visualization is used to evoke a specific emotional response				✓	

Content Standard 38.2: Students demonstrate knowledge of and an appreciation for the visual arts

BIL: **Essential –** IM **Recommended** - ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
38.2.1 Compare/contrast the visual art styles of various historical periods				✓	
38.2.2 Define various forms of visual art				✓	
38.2.3 Define the various elements of visual arts (e.g., lines, colors, light and dark, texture, volume, perspective) and performing arts				✓	
38.2.4 Identify the feelings conveyed by various elements of visual arts				✓	
38.2.5 Discuss how music and visuals to can evoke a specific emotional response				✓	

Unit 39: Graphic Design Fundamentals

Content Standard 39.1: Students demonstrate basic technical art skills (traditional and electronic)

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
39.1.1 Make computations for centering, spacing, and scaling drawings				✓	
39.1.2 Employ various types of drawing media and a variety of surfaces				✓	
39.1.3 Employ various mechanical drawing equipment				✓	
39.1.4 Interpret information from drawings, prints, and sketches				✓	
39.1.5 Draw freehand sketches				✓	
39.1.6 Draw auxiliary views				✓	
39.1.7 Draw one- and two-point perspectives				✓	
39.1.8 Alter drawings				✓	
39.1.9 Create charts, graphs, and diagrams				✓	
39.1.10 Evaluate drawings				✓	
39.1.11 Make multi-layered images				✓	

Content Standard 39.2: Students demonstrate knowledge of design principles

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM	I	P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
39.2.1 Demonstrate knowledge of applying principles of basic composition (rule of thirds, balance, etc.)				✓	
39.2.2 Demonstrate knowledge of the principles and elements of design and their relationship to each other				✓	
39.2.3 Demonstrate knowledge of the nature of color and color harmonies				✓	
39.2.4 Assess the impact of various color harmonies on a two-dimensional picture plan				✓	
39.2.5 Assess how color affects the principles of line, value, shape and form				✓	

Content Standard 39.3: Students demonstrate design skills

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
39.3.1 Apply elements of design (e.g., line, shape, color)				✓	
39.3.2 Apply principles of design (e.g., proportion, balance, harmony, rhythm, unity)				✓	
39.3.3 Apply color theory for emotional impact				✓	
39.3.4 Use tones, hues, and values				✓	
39.3.5 Develop thumbnail concepts				✓	
39.3.6 Develop rough and comprehensive layouts				✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
39.3.7 Paint freehand or within sketched designs using mixed colors				✓	
39.3.8 Apply color for impact				✓	
39.3.9 Determine appropriate uses of halftone, duotone, and multi-color processes				✓	
39.3.10 Create symmetric and asymmetric designs				✓	
39.3.11 Create various mock-ups and dummies				✓	
39.3.12 Select appropriate style for desired impact				✓	
39.3.13 Make multi-layered images				✓	
39.3.14 Describe digital color concepts				✓	

Content Standard 39.4: Students create computer graphics

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM		I	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
39.4.1 Identify types of graphics				✓	
39.4.2 Define audience and purpose of graphics				✓	
39.4.3 Select the appropriate style of graphics based on the intended purpose				✓	
39.4.4 Create graphics that integrate principles of communication and elements of visual design				✓	
39.4.5 Manipulate color, shape, size, and textures of graphics				✓	
39.4.6 Import objects from other applications				✓	
39.4.7 Export objects to other applications				✓	
39.4.8 Rotate graphics				✓	
39.4.9 Rotate text				✓	
39.4.10 Paint/touch up images				✓	
39.4.11 Add/subtract image parts				✓	
39.4.12 Apply 2-D and 3-D graphics principles				✓	
39.4.13 Manipulate multiple image layers				✓	
39.4.14 Employ masking techniques				✓	
39.4.15 Crop images				✓	
39.4.16 Scale images				✓	
39.4.17 Employ various effects and/or filters				✓	
39.4.18 Convert vector to raster images				✓	
39.4.19 Store images in appropriate formats and resolutions for specific applications				✓	
39.4.20 Save/retrieve graphics				✓	
39.4.21 Print graphics to various output devices				✓	
39.4.22 Store images in appropriate formats and resolutions for specific applications				✓	

Content Standard 39.5: Students apply knowledge of typography

BIL: Essential – IM
RC:

EDU:	10	12	AD
IM	I	P	

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
39.5.1 Demonstrate knowledge of typography materials				✓	
39.5.2 Interpret typographic terms				✓	
39.5.3 Demonstrate knowledge of typographic methods				✓	
39.5.4 Demonstrate knowledge of proofreaders' marks				✓	
39.5.5 Demonstrate knowledge of picas, points, and their conversion to inches				✓	
39.5.6 Demonstrate knowledge of specification of type and copy fitting				✓	
39.5.7 Identify typographic styles				✓	
39.5.8 Define basic letter structures				✓	
39.5.9 Mix families of type within a project and within certain parameters				✓	
39.5.10 Interpret typographical specifications				✓	
39.5.11 Select proper letter and line spacing				✓	
39.5.12 Select appropriate typefaces				✓	
39.5.13 Prepare type formats (e.g., style sheets)				✓	
39.5.14 Create templates				✓	

Unit 40: Photography

Content Standard 40.1: Students develop competency in the use of photographic equipment.

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS		I	
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
40.1.1 Differentiate between various formats (i.e., traditional vs. digital)				✓	
40.1.2 Select appropriate camera format for given situation				✓	
40.1.3 Demonstrate knowledge of apertures				✓	
40.1.4 Identify appropriate depth of field				✓	
40.1.5 Employ the concept of bracketing				✓	
40.1.6 Employ appropriate shutter speeds				✓	
40.1.7 Employ appropriate shutter speed for desired exposure effects				✓	
40.1.8 Calculate equivalent exposures				✓	
40.1.9 Identify desired exposure using a light meter				✓	
40.1.10 Provide needed lighting conditions using electronic flash units				✓	
40.1.11 Create photographs using varied lighting and formats				✓	
40.1.12 Create photographs using different lenses (e.g., wide-angle, telephoto, zoom)				✓	
40.1.13 Identify appropriate light sources				✓	
40.1.14 Create photographs using various lens filters (e.g., color-compensating, polarizing, special effects, black-and-white contrast control)				✓	

Content Standard 40.2: Students demonstrate knowledge of photographic terminology

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
40.2.1 Discuss the role played by the following photographic elements: composition, formal qualities, scale, use of space, use of light				✓	
40.2.2 Discuss how the meaning of a photograph is affected by composition, formal qualities, scale, use of space, and use of light				✓	
40.2.3 Use different lenses to create optical effects				✓	
40.2.4 Identify the use and meaning of symbolism in given photographs				✓	
40.2.5 Identify the use and meaning of metaphor in given photographs				✓	

Unit 41: Visual Media Design

Content Standard 41.1: Students create visual design guidelines

BIL: Essential – IM **Recommended –**ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD		I	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
41.1.1 Integrate paint, illustration, and imaging manipulation techniques with digital images				✓	
41.1.2 Consider the visual characteristics of various mediums (i.e., video, print, web)				✓	
41.1.3 Assess how the technical limitations of the medium affect content and style				✓	
41.1.4 Consider the relationship between form and content				✓	
41.1.5 Plan a visual design utilizing the form follows function principle				✓	
41.1.6 Create a multi-layered image				✓	
41.1.7 Select appropriate colors for the design				✓	
41.1.8 Define color editing capabilities				✓	
41.1.9 Identify appropriateness of 3-D elements Integrate human factors and user interface in visual design				✓	
41.1.10 Evaluate visual appeal of design				✓	
41.1.11 Construct model (i.e., physical or computer-based)				✓	
41.1.12 Evaluate model against guidelines				✓	

Content Standard 41.2: Students demonstrate proficiency in the use of digital imaging techniques and equipment

BIL: Essential – IM **Recommended –**ISS, PSD
RC:

EDU:	10	12	AD
ISS			I
PSD		I	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
41.2.1 Identify standard hardware platform components and configurations (e.g., UNIX, IBM, Macintosh)				✓	
41.2.2 Identify memory and storage requirements				✓	
41.2.3 Identify computer architecture requirements for digital imaging				✓	
41.2.4 Explain how a digital image is generated				✓	
41.2.5 Identify types of digital imaging software				✓	
41.2.6 Compare performance of different types of image acquisition hardware				✓	
41.2.7 Operate digital imaging equipment (e.g., scanner, digital camera, video input devices, graphics tablet, graphics expansion board, printer, film recorder, and output devices)				✓	
41.2.8 Identify various camera to computer interfaces (e.g., firewire USB, card readers, video system cards)				✓	
41.2.9 Compare/contrast area and linear arrays				✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
41.2.10 Compare/contrast exposure and multiexposure systems				✓	
41.2.11 Compare/contrast layering techniques				✓	
41.2.12 Select appropriate resolution				✓	
41.2.13 Perform resolution calculations (e.g., number of pixels, number of colors)				✓	
41.2.14 Compare/contrast addressable and displayable resolution				✓	
41.2.15 Archive and manage images				✓	

Unit 42: Digital Video Production

Content Standard 42.1: Students demonstrate knowledge of the history of film and video production

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.1.1 Identify job responsibilities of Hollywood-style studio personnel				✓	
42.1.2 Identify and analyze technical elements used in classic films				✓	
42.1.3 Differentiate film aspect ratios and their place in history				✓	
42.1.4 Outline significant changes in marketing of films				✓	
42.1.5 Identify the characteristics of various camera formats (e.g., Betacam, VHS, 8mm, super VHS, mini DV, and DV-Cam)				✓	
42.1.6 Compare/contrast digital and analog production systems				✓	

Content Standard 42.2: Students create a plan for video production

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.2.1 Develop script outline				✓	
42.2.2 Develop script				✓	
42.2.3 Create storyboard and scenes (video, audio, music, effects, transitions, style, etc.)				✓	
42.2.4 Identify tasks required to price production needs				✓	
42.2.5 Identify scheduling needs				✓	
42.2.6 Identify potential locations for shooting				✓	
42.2.7 Specify tasks and working relationships for crew (camera, grips, director, talent, etc.)				✓	
42.2.8 Identify steps needed to acquire talent				✓	
42.2.9 Analyze script for additional needs				✓	
42.2.10 Identify needed equipment and props (camera, lighting, and audio needs)				✓	
42.2.11 Identify editing needs				✓	

Content Standard 42.3: Students perform camera-related tasks for a video production

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.3.1 Analyze the aesthetic needs of a shot and accomplish them				✓	
42.3.2 Organize the proper care and handling of camera and camera assist equipment				✓	
42.3.3 Analyze the script and storyboard for camera lens and shot requirements				✓	
42.3.4 Organize pre and post-production routines for camera operation				✓	
42.3.5 Analyze production requirements to determine camera equipment needs				✓	

Content Standard 42.4: Students perform lighting activities for a video production

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.4.1 Identify different types of lighting fixtures and safety requirements				✓	
42.4.2 Compare/ contrast hard (direct) and soft (diffuse) lighting.				✓	
42.4.3 Identify parts of lighting fixtures and the function of each				✓	
42.4.4 Analyze color of existing lighting in various conditions				✓	
42.4.5 Calculate electrical requirements for safe operation of lights				✓	
42.4.6 Identify various applications of stage lighting equipment				✓	
42.4.7Describe functions of master lighting panel and dimmer board				✓	
42.4.8 Analyze/document lighting requirements for production				✓	
42.4.9 Set up appropriate lighting for a production				✓	
42.4.10 Operate master lighting panel and dimmer board in accordance with specifications				✓	
42.4.11 Appraise maintenance needs for lighting equipment				✓	
42.4.12 Design special effects lighting				✓	

Content Standard 42.5: Students design backgrounds/scenery for a video production

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.5.1 Design scenic plans to scale				✓	
42.5.2 Interpret scenic plans and storyboard to determine the materials and hardware needed for scenic construction				✓	
42.5.3 Formulate design strategies for the construction of scenery				✓	
42.5.4 Create special effects scenery				✓	
42.5.5 Select stage props				✓	
42.5.6 Inspect/repair scenery as needed				✓	
42.5.7 Create appropriate digital backgrounds as needed				✓	
42.5.8 Use video footage as background as needed				✓	
42.5.9 Utilize appropriate backdrops for production				✓	

Content Standard 42.6: Students operate video cameras/camcorders

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.6.1 Set white balance for different lighting conditions (e.g., tungsten, daylight, backlight)				✓	
42.6.2 Perform setup functions (e.g., balance, level, and friction adjustment of tripod)				✓	
42.6.3 Practice camera movements (e.g., panning, zooming, tilting) using a tripod and handheld camera				✓	
42.6.4 Practice manual iris and focus				✓	
42.6.5 Play back recording on monitor				✓	
42.6.6 Adjust a video camera to changing light levels and temperatures				✓	
42.6.7 Describe how a camera converts light to an electronic signal, CCD, CMOS, single vs. multi-chip, optics, A-D Converter				✓	

Content Standard 42.7: Students perform technical support tasks for a video production

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.7.1 Formulate strategies to properly utilize grip equipment during video production				✓	
42.7.2 Create solutions to unique shooting problems				✓	
42.7.3 Organize pre- and post-production routines				✓	
42.7.4 Analyze production requirements to determine grip equipment needs				✓	
42.7.5 Create required effects for lighting set-ups				✓	
42.7.6 Demonstrate safe work habits				✓	
42.7.7 Work as a member of a cross-trained video production team				✓	

Content Standard 42.8: Students identify video formats

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.8.1 Compare/contrast consumer, industrial, and broadcast-grade video cameras				✓	
42.8.2 Identify the characteristics of existing and emerging video formats (DV, mini-DV, DVD, HD, etc.)				✓	
42.8.3 Identify image characteristics affected by camera choice				✓	
42.8.4 Compare/contrast technical aspects of NTSC, PAL, SECAM, HDTV video signals (scanning, frame rate, frame size, etc.)				✓	
42.8.5 Describe frame synchronization and time base correction				✓	
42.8.6 Identify compression formats for conversion to digital video				✓	

Content Standard 42.9: Students capture digital video or digitize analog video

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.9.1 Compare/contrast methods of capture				✓	
42.9.2 Identify the appropriate capture procedure for video formats (DV, mini-DV, DVD, HD, etc.)				✓	
42.9.3 Students will manage files associated with capture, project file management				✓	

Content Standard 42.10: Students edit video (nonlinear)

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.10.1 Compare/contrast editing styles				✓	
42.10.2 Identify the appropriate capture procedure for video formats (DV, mini-DV, DVD, HD, etc.)				✓	
42.10.3 Edit video (trimming, cutting, still images, etc.)				✓	

Content Standard 42.11: Students select filters, transitions, and effects

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.11.1 Students identify chromakey, masking, rotoscoping, and matte techniques				✓	
42.11.2 Assess transition needs				✓	
42.11.3 Apply transitions				✓	
42.11.4 Visualize effect needs				✓	
42.11.5 Apply appropriate effects				✓	
42.11.6 Color correct video as needed				✓	

Content Standard 42.12: Students output appropriate video

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM	I	P	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
42.12.1 Students compare file formats				✓	
42.12.2 Analyze file size capabilities				✓	
42.12.3 Use correct output media				✓	

Unit 43: Audio Production

Content Standard 43.1: **Students demonstrate knowledge of audio recording and sound reinforcement**

BIL: **Essential** – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
43.1.1 Describe basic acoustic principles				✓	
43.1.2 Classify amplitude (dB) and frequency (Hz)				✓	
43.1.3 Evaluate elements of electricity (volts, amps, ohms, watts)				✓	
43.1.4 Assess common microphone types (condenser, dynamic)				✓	
43.1.5 Assess microphone styles (lapel, boom, hand held, etc.)				✓	
43.1.6 Evaluate history of analog and digital audio formats (vinyl to DVD)				✓	
43.1.7 Outline history of recording technology				✓	
43.1.8 Illustrate basic harmonic theory (complexity of frequencies)				✓	
43.1.9 Identify components of a speaker				✓	
43.1.10 Differentiate speaker baffle types (infinite vs. finite)				✓	
43.1.11 Compare and contrast the properties of analog and digital recording				✓	
43.1.12 Describe the characteristics of signal processing				✓	
43.1.13 Contrast sound reinforcement techniques with studio techniques				✓	
43.1.14 Critique recordings				✓	
43.1.15 Analyze current trends in electronic music				✓	
43.1.16 Describe MIDI				✓	
43.1.17 Describe how analog signals are digitized				✓	
43.1.18 Select music appropriate for a given application				✓	
43.1.19 Demonstrate digital sampling for compressing sound files				✓	
43.1.20 Describe methods of analog and digital editing				✓	
43.1.21 Explain digital audio bandwidths and their implications				✓	
43.1.22 Describe the various computer hardware and software used in studio recording				✓	
43.1.23 Identify the parts of an audio mixing console/applications				✓	
43.1.24 Identify future technologies predicted for audio recording				✓	

Content Standard 43.2: Students demonstrate knowledge of audio production

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
43.2.1 Operate a mixing console/application, including its input and output functions				✓	
43.2.2 Describe the characteristics and applications of signal processing				✓	
43.2.3 Edit audio recordings				✓	

Content Standard 43.3: Students create a sound track

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
43.3.1 Evaluate performance needs				✓	
43.3.2 Analyze script information to identify sound requirements				✓	
43.3.3 Design sound score appropriate to production and post-production needs				✓	
43.3.4 Select sound material				✓	
43.3.5 Hire and coordinate talent, if necessary				✓	
43.3.6 Incorporate foley				✓	
43.3.7 Set up audio signal flow and recording studio				✓	
43.3.8 Operate recording software				✓	

Content Standard 43.4: Students manage a recording session

BIL: Essential – IM **Recommended –**ISS
RC:

EDU:	10	12	AD
ISS			I
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
43.4.1 Evaluate performance needs and talent's goals				✓	
43.4.2 Select appropriate technology (mics, effects, monitoring)				✓	
43.4.3 Manage cabling, software files, talent interaction				✓	
43.4.4 Manage scheduling, keeping sessions on time				✓	
43.4.5 Document takes and other important events				✓	

Unit 44: Product Development Life Cycle

This unit details the methodology for the development and implementation of an IT-related work product or system. Competencies providing background or related knowledge and skills needed to understand and/or complete a phase in the process are marked with a double asterisk (**) and follow competencies focusing on a specific phase in the process. It is recommended that process oriented competencies in this unit be taught in conjunction with (not separate from) technical skills.

Initiation/Planning Phase – Product Planning

Content Standard 44.1: Students evaluate product planning methodology

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		I	R
PSD		I	P
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.1.1 Define terms associated with product planning	✓	✓		✓	
44.1.2 Identify steps associated with product planning	✓	✓		✓	
44.1.3 Identify methodologies associated with product planning	✓	✓		✓	
44.1.4 Define the project's contribution to business needs	✓	✓		✓	
44.1.5 Identify stakeholders and decision makers	✓	✓		✓	
44.1.6 Define the scope of the product	✓	✓		✓	
44.1.7 Evaluate product requirements	✓	✓		✓	
44.1.8 Develop task list (e.g., work breakdown structures)	✓	✓		✓	
44.1.9 Prioritize tasks according to business needs	✓	✓		✓	
44.1.10 Identify required resources and budget	✓	✓		✓	
44.1.11 Develop initial project management flowchart	✓	✓		✓	
44.1.12 Identify critical milestones	✓	✓		✓	
44.1.13 Evaluate risks	✓	✓		✓	
44.1.14 Prepare contingency plan	✓	✓		✓	
44.1.15 Develop a method of evaluation	✓	✓		✓	
44.1.16 Explain alternative development methodologies	✓	✓		✓	

Requirement Analysis Phase

Content Standard 44.2: Students conduct requirements analysis

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS	I	IR	P
NS		I	P
PSD		I	P
IM	I	R	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.2.1 Identify business needs/expectations	✓	✓		✓	
44.2.2 Analyze use of product or system	✓	✓		✓	
44.2.3 Specify functional requirements	✓	✓		✓	
44.2.4 Specify data requirements	✓	✓		✓	
44.2.5 Describe how processes and data support business expectations	✓	✓		✓	
44.2.6 Develop test criteria and plans	✓	✓		✓	
44.2.7 Revise documentation prepared in initiation/planning	✓	✓		✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
phase as needed					
44.2.8 Generate task status report	✓	✓		✓	
44.2.9 Track critical milestones	✓	✓		✓	
44.2.10 Participate in project phase review	✓	✓		✓	
44.2.11 Report project status	✓	✓		✓	

Content Standard 44.3: Students demonstrate knowledge of the requirements analysis

BIL: Essential – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
44.3.1 Identify business expectations	✓	✓		✓	
44.3.2 Explain how implementation will impact the environment	✓	✓		✓	
44.3.3 Explain budget and time restraints	✓	✓		✓	
44.3.4 Explain how the business environment impacts requirements (e.g., risks and rewards)	✓	✓		✓	
44.3.5 Explain how internal and external forces impact product requirements	✓	✓		✓	
44.3.6 Explain how legal and regulatory issues impact product requirements	✓	✓		✓	

Design Phase

Content Standard 44.4: Students identify current technical environment

BIL: Essential – ISS, **Recommended** – NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
44.4.1 Identify current internal and external technical resources	✓	✓			
44.4.2 Identify current internal and external technology	✓	✓			
44.4.3 Identify internal and external processes	✓	✓			

Content Standard 44.5: Students demonstrate knowledge of design alternatives and options

BIL: **Essential** – ISS, **Recommended** – NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.5.1 Determine return on investment (ROI) (e.g., cost-benefit analysis)	✓	✓			
44.5.2 Explain Total Cost of Ownership (TCO)	✓	✓			
44.5.3 Define risks and rewards of each option	✓	✓			
44.5.4 Explain the components of "build versus buy"	✓	✓			
44.5.5 Explain processes to compare design versus requirements	✓	✓			

Development/Implementation Phase

Content Standard 44.6: Students demonstrate knowledge of how systems and products are developed

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS	I	P	R
NS		I	P
PSD	I	R	P
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.6.1 Define components that go into the development plan (e.g., hardware, software, communications)	✓	✓		✓	
44.6.2 Explain what makes a good development plan (e.g., end-user involvement, programming code reviews, etc.)	✓	✓		✓	
44.6.3 Identify documentation requirements in initiation/planning phase as needed	✓	✓		✓	
44.6.4 Explain project status report	✓	✓		✓	
44.6.5 Define purpose of critical milestones and paths	✓	✓		✓	
44.6.6 Discuss need for project phase review	✓	✓		✓	
44.6.7 Report project status	✓	✓		✓	

Content Standard 44.7: Students discuss solutions versus requirements

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	R
PSD		I	P
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.7.1 Explain how unit testing is used to validate requirements	✓	✓		✓	
44.7.2 Explain the purpose of technical review	✓	✓		✓	
44.7.3 Explain the purpose of end-user solution review	✓	✓		✓	

Content Standard 44.8: Students describe key components of an implementation plan (e.g., communication, business continuity plan, etc.

BIL: **Essential** – ISS, **Recommended** – NS, PSD, IM
RC:

EDU:	10	12	AD
ISS			P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.8.1 Identify turn-back points (e.g., go-no-go)	✓	✓		✓	
44.8.2 Identify new work processes and procedures	✓	✓		✓	
44.8.3 Identify steps all business units must take to implement	✓	✓		✓	
44.8.4 Identify decision criteria for retiring old solution (e.g., displaced technology)	✓	✓		✓	

Content Standard 44.9: Students explain the value a communication plan can provide to implementation

BIL: **Essential** – ISS **Recommended** – NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	R
PSD		I	P
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.9.1 Identify communication vehicles	✓	✓		✓	
44.9.2 Identify components of a communication plan	✓	✓		✓	
44.9.3 Explain the importance of audience when developing a communication plan	✓	✓		✓	
44.9.4 Describe types of communication channels (e.g., formal vs. informal)	✓	✓		✓	
44.9.5 Define stakeholder relationships (e.g., customer, employers, shareholders, suppliers	✓	✓		✓	

Content Standard 44.10: Students explain the value a training plan can provide to implementation

BIL: **Essential** – ISS **Recommended** – NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.10.1 Identify components of training plan	✓	✓		✓	
44.10.2 Identify common training methodologies (computer-based, hands on)	✓	✓		✓	
44.10.3 Identify strengths and weaknesses of each methodology	✓	✓		✓	
44.10.4 Identify functions of a training plan	✓	✓		✓	

Content Standard 44.11: Students explain how business continuity plans (e.g., disaster recovery, roll-back, etc.) interrelate with the implementation plans.**

BIL: **Essential** – ISS **Recommended** – NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.11.1 Describe purpose and components of a roll-back plan (e.g., go-no-go)	✓	✓		✓	
44.11.2 Describe purpose and components of a fall-back plan (e.g., disaster recovery plan)	✓	✓		✓	
44.11.3 Describe purpose and components of a business continuity plan	✓	✓		✓	

Quality Assurance and Testing

Content Standard 44.12: Students compare/contrast quality assurance processes

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.12.1 Discuss the historical evolution of quality assurance initiatives	✓	✓		✓	
44.12.2 Interpret quality management terminology	✓	✓		✓	
44.12.3 Identify the role of quality within the organization	✓	✓		✓	
44.12.4 Identify the features and benefits of quality planning	✓	✓		✓	
44.12.5 Discuss the relationship among organizational structures, policies, procedures and quality assurance	✓	✓		✓	
44.12.6 Identify successful efforts by industry to improve quality and/or reduce costs	✓	✓		✓	
44.12.7 Differentiate between prevention and detection	✓	✓		✓	
44.12.8 Differentiate between variable and attribute data	✓	✓		✓	
44.12.9 Identify types of control charts	✓	✓		✓	
44.12.10 Explain how statistical techniques are used to control quality	✓	✓		✓	

Content Standard 44.13: Students demonstrate knowledge of the testing environment

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.13.1 Identify the purpose of integration testing	✓	✓		✓	
44.13.2 Identify the purpose of system and product testing	✓	✓		✓	
44.13.3 Identify the purpose of security testing	✓	✓		✓	
44.13.4 Identify the purpose of acceptance testing	✓	✓		✓	

Maintenance/Operations Phase

Content Standard 44.14: Students demonstrate knowledge of ongoing operations and maintenance

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM			P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.14.1 Describe maintenance and operations phase	✓			✓	
44.14.2 Identify systems and product operations	✓			✓	
44.14.3 Define problem and modification process	✓			✓	
44.14.4 Define steps to maintain system and product	✓			✓	
44.14.5 Revise previous documentation as needed	✓			✓	

Content Standard 44.15: Students explain the role of maintenance as part of the ongoing function

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
44.15.1 Define components of maintenance contracts	✓			✓	
44.15.2 Define upgrade process	✓			✓	
44.15.3 Define Service Level Agreements	✓			✓	

Content Standard 44.16: Students discuss components of incidence and problem management

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
44.16.1 Define escalation process	✓	✓		✓	
44.16.2 Explain different methodologies for event notification (e.g., paging, e-mail)	✓	✓		✓	
44.16.3 Explain support contract	✓	✓		✓	

Content Standard 44.17: Students identify components of change management process

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
44.17.1 Define the change and value of change	✓	✓		✓	
44.17.2 Define when to do change	✓	✓		✓	
44.17.3 Explain what change entails	✓	✓		✓	
44.17.4 Explain the impact of change	✓	✓		✓	
44.17.5 Contact all affected parties	✓	✓		✓	
44.17.6 Identify back-up plan	✓	✓		✓	

Unit 45: Project Management

Project Initiation

Content Standard 45.1: Students explain the role and need for project management

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	
PSD			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
45.1.1 Identify the areas of application for project management	✓	✓		✓	
45.1.2 Define the needs for meeting project expectations	✓	✓		✓	
45.1.3 Explain the merging of product lifecycle management with project management	✓	✓		✓	

Content Standard 45.2: Students assess the components for initial project management efforts

BIL: **Essential** – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS			
PSD			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
45.2.1 Identify the stakeholders involved in the process	✓			✓	
45.2.2 Select a project management team	✓			✓	
45.2.3 Describe the results needed for project success	✓			✓	
45.2.4 Discuss the need to manage risks and constraints	✓			✓	

Planning

Content Standard 45.3: Students analyze the need for planning project inception to completion

BIL: **Essential** – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	
PSD			I
IM		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
45.3.1 Define the tasks needed for completion	✓	✓		✓	
45.3.2 Outline the project from start to end	✓	✓		✓	
45.3.3 Discuss time requirements needed for each task	✓	✓		✓	
45.3.4 Determine significant milestones during project timeline	✓	✓		✓	
45.3.5 Identify the budget requirements for project completion	✓	✓		✓	
45.3.6 Review all necessary resources, supplies and materials	✓	✓		✓	
45.3.7 Finalize a plan for project implementation	✓	✓		✓	

Execution

Content Standard 45.4: Students explain the value of proper project execution

BIL: **Essential** – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	
PSD			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
45.4.1 Discuss the need to have successful first steps in the project timeline	✓	✓		✓	
45.4.2 Explain the importance of open communications and productivity	✓	✓		✓	
45.4.3 Review the significant milestones	✓	✓		✓	

Management/Controlling

Content Standard 45.5: Students outline the necessary steps for staying on task for project completion

BIL: **Essential** – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	
PSD			I
IM	I	IR	PR

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
45.5.1 Review project schedules and expenses	✓	✓		✓	
45.5.2 Discuss project changes and modifications	✓	✓		✓	
45.5.3 Review the importance of quality management	✓	✓		✓	
45.5.4 Identify project obstacles and problems	✓	✓		✓	

Closing/Completion

Content Standard 45.6: Students plan the final tasks necessary for project completion and signoff

BIL: **Essential** – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	
PSD			I
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
45.6.1 Review milestones and corresponding completion dates	✓	✓		✓	
45.6.2 Create punch list of tasks remaining for completion	✓	✓		✓	
45.6.3 Prepare documentation for project signoff	✓	✓		✓	

Unit 46: Business Law and Legal Issues

Content Standard 46.1: Students apply practices that respect intellectual laws

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	I	R	P
NS		P	R
PSD	I	P	R
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
46.1.1 Distinguish among the various forms of intellectual property rights (e.g., copyright, patent, trademark, trade secrets)	✓			✓	
46.1.2 Define plagiarism, authorship, work made for hire, and fair use	✓			✓	
46.1.3 Compare/contrast the rights granted under copyright, patent, and trademark	✓			✓	
46.1.4 Discuss legal issues related to electronic imagery	✓			✓	
46.1.5 Discuss consequences of the violation of intellectual property and software licensing intellectual laws	✓			✓	
46.1.6 Discuss the liability for invasion of privacy, slander, and libel	✓			✓	
46.1.7 Discuss confidentiality issues and their liability implications	✓			✓	
46.1.8 Demonstrate an application of intellectual laws through projects/products produced	✓			✓	

Content Standard 46.2: Students describe the components of contracts

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS			P
NS		I	P
PSD		I	P
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
46.2.1 Define statement of work	✓			✓	
46.2.2 Define duration	✓			✓	
46.2.3 Define liabilities	✓			✓	
46.2.4 Define termination clause	✓			✓	
46.2.5 Define service level agreements	✓			✓	
46.2.6 Define exclusions	✓			✓	
46.2.7 Define warranties	✓			✓	
46.2.8 Explain dispute resolution	✓			✓	
46.2.9 Define terms and conditions	✓			✓	

Content Standard 46.3: Students explain current regulatory laws and regulation (e.g., HIPAA, Gramm-Leach-Bliley, Sarbanes-Oxley, NSA—National Security Act, Homeland Security, Civil Rights, and Disability Rights)

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS			P
NS		I	P
PSD		I	P
IM	I	IR	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
46.3.1 Explain the impact of regulatory compliance issues on the design and development process	✓			✓	
46.3.2 Define/explain the impact of non-compliance to the company/organization	✓			✓	
46.3.3 Explain risk of non-compliance to the company/organization	✓			✓	
46.3.4 Explain the risk of non-compliance to Civil Rights Laws and regulations	✓			✓	
46.3.5 Explain the risk of non-compliance to Disability Laws	✓			✓	

Unit 47: Technical Writing and Documentation

Content Standard 47.1: Students evaluate technical writing requirements

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
47.1.1 Define/prioritize communication needs	✓	✓		✓	ISS, PSD
47.1.2 Resolve conflicting requirements	✓	✓		✓	ISS, PSD
47.1.3 Specify project objectives	✓	✓		✓	ISS, PSD
47.1.4 Determine the size and specifics of the work to be completed	✓	✓		✓	ISS, PSD
47.1.5 Estimate time, materials, and capabilities needed to complete assignment	✓	✓		✓	ISS, PSD
47.1.6 Identify criteria for successful completion of project	✓	✓		✓	ISS, PSD
47.1.7 Evaluate strengths and weaknesses of completed project	✓	✓		✓	ISS, PSD

Content Standard 47.2: Students write technical reports

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
47.2.1 Determine audience	✓	✓		✓	ISS, PSD
47.2.2 Access needed information using standard references and sources	✓	✓		✓	ISS, PSD
47.2.3 Identify type of report needed	✓	✓		✓	ISS, PSD
47.2.4 Compile relevant data	✓	✓		✓	ISS, PSD
47.2.5 Organize data into charts and graphs	✓	✓		✓	ISS, PSD
47.2.6 Analyze data	✓	✓		✓	ISS, PSD
47.2.7 Draw conclusions from data analysis	✓	✓		✓	ISS, PSD
47.2.8 Outline report	✓	✓		✓	ISS, PSD
47.2.9 Draft report	✓	✓		✓	ISS, PSD
47.2.10 Edit report (e.g., check spelling, grammar, punctuation, sentence structure, accuracy of content)	✓	✓		✓	ISS, PSD
47.2.11 Review report with peers	✓	✓		✓	ISS, PSD
47.2.12 Revise report as needed based on peer feedback	✓	✓		✓	ISS, PSD
47.2.13 Proofread revised report	✓	✓		✓	ISS, PSD
47.2.14 Present reports	✓	✓		✓	ISS, PSD

Content Standard 47.3: Students conduct technical research

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
47.3.1 Identify target audience	✓	✓		✓	ISS, PSD
47.3.2 Define research questions	✓	✓		✓	ISS, PSD
47.3.3 Determine priorities for the information that should be gathered	✓	✓		✓	ISS, PSD
47.3.4 Identify potential sources of information	✓	✓		✓	ISS, PSD
47.3.5 Target audience/user group as a key information source	✓	✓		✓	ISS, PSD
47.3.6 Identify subject-matter experts	✓	✓		✓	ISS, PSD
47.3.7 Evaluate potential sources of information based on established criteria (e.g., affordability, relevance)	✓	✓		✓	ISS, PSD
47.3.8 Conduct interviews with selected human information sources	✓	✓		✓	ISS, PSD
47.3.9 Gather information from selected print and electronic sources	✓	✓		✓	ISS, PSD
47.3.10 Determine the accuracy and completeness of the information gathered	✓	✓		✓	ISS, PSD

Content Standard 47.4: Students design technical documentation

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD	I	R	P
IM	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
47.4.1 Define purpose of documentation	✓	✓		✓	PSD
47.4.2 Specify standards for documentation, including critical success criteria	✓	✓		✓	PSD
47.4.3 Identify delivery options	✓	✓		✓	PSD
47.4.4 Evaluate cost-effectiveness of each delivery option	✓	✓		✓	PSD
47.4.5 Select tools appropriate for task purpose	✓	✓		✓	PSD
47.4.6 Plan information flow	✓	✓		✓	PSD
47.4.7 Select writing style and tone appropriate for given documentation	✓	✓		✓	PSD
47.4.8 Determine level of detail needed	✓	✓		✓	PSD
47.4.9 Identify visuals appropriate for given documentation	✓	✓		✓	PSD
47.4.10 Provide feedback on design to development team/individual	✓	✓		✓	PSD

Content Standard 47.5: Students develop technical documentation

BIL: Essential – ISS, IM **Recommended** – NS, PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
47.5.1 Determine audience	✓	✓	✓	✓	
47.5.2 Interpret specifications, parameters, or drawings for audience	✓	✓	✓	✓	
47.5.3 Record process (e.g., flowchart, step-by-step narrative)	✓	✓	✓	✓	
47.5.4 Record data	✓	✓	✓	✓	
47.5.5 Maintain test logs	✓	✓	✓	✓	
47.5.6 Compile cumulative reference/record	✓	✓	✓	✓	
47.5.7 Measure compliance with established parameters	✓	✓	✓	✓	
47.5.8 Verify the accuracy and validity of the information	✓	✓	✓	✓	
47.5.9 Select and organize information	✓	✓	✓	✓	
47.5.10 Present content in clear and concise way	✓	✓	✓	✓	
47.5.11 Employ presentation tools and techniques appropriate for the given documentation	✓	✓	✓	✓	
47.5.12 Obtain feedback on the information provided and its technical accuracy	✓	✓	✓	✓	
47.5.13 Test documentation for usability	✓	✓	✓	✓	
47.5.14 Edit documentation for readability, grammar, and usage	✓	✓	✓	✓	
47.5.15 Maintain required logs	✓	✓	✓	✓	
47.5.16 Track expenses involved	✓	✓	✓	✓	

Unit 48: Professional Practices

Content Standard 48.1: Students compare/contrast legal and ethical behavior

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD	I	P	R
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
48.1.1 Differentiate between legal and ethical behavior	✓		✓	✓	
48.1.2 Explain terms, principles, and characteristics of legal and ethical behavior (e.g. loyalty, discretion, solicitation, competitor, supplier)	✓		✓	✓	
48.1.3 Explain legal ramifications of breaching rules and regulations	✓		✓	✓	
48.1.4 Explain the effects and consequences of unethical and/or unlawful behavior	✓		✓	✓	

Content Standard 48.2: Students explain professional responsibilities

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD	I	P	R
IM	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
48.2.1 Explain the need for professional and ethical standards	✓		✓	✓	
48.2.2 Explain responsibility of the individual to apply ethical standards	✓		✓	✓	
48.2.3 Exhibit a professional approach to daily activities	✓		✓	✓	

Content Standard 48.3: Students outline the role of the IT professional in maintaining customer satisfaction

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
48.3.1 Explain the nature of positive customer/client relations	✓		✓	✓	
48.3.2 Describe the importance of all customers to the business	✓		✓	✓	
48.3.3 Explain the importance of interaction with customers in a professional manner	✓		✓	✓	
48.3.4 Explain the importance of maintaining customer base	✓		✓	✓	
48.3.5 Determine appropriate communication vehicles (phone, e-mail, face-to- face)	✓		✓	✓	
48.3.6 Differentiate internal vs. external customer service (cost of existing versus new)	✓		✓	✓	
48.3.7 Discuss the role of company image	✓		✓	✓	

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
48.3.8 Discuss the role of customer feedback in customer satisfaction	✓		✓	✓	
48.3.9 Define function of call center	✓		✓	✓	
48.3.10 Identify customer expectations	✓		✓	✓	
48.3.11 Meet client/customer expectations	✓		✓	✓	

Content Standard 48.4: Students outline the importance of teams in achieving IT project goals

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD		I	P
IM		I	P

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
48.4.1 Identify desired group and team behavior in an IT context	✓		✓	✓	
48.4.2 Explain the importance of cross-functional teams in the IT environment	✓		✓	✓	
48.4.3 Define roles/responsibilities within the group decision making process	✓		✓	✓	
48.4.4 Identify ways to assess team productivity and results	✓		✓	✓	
48.4.5 Demonstrate effective team member practices	✓		✓	✓	

Content Standard 48.5: Students explain the importance of teams in an IT environment

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS		I	P
NS		P	R
PSD		I	P
IM	I	P	R

Performance Expectations:	*ISS*	*NS*	*PSD*	*IM*	*Core*
48.5.1 Identify appropriate resources for company policies affecting professional behavior (e.g., organizational policies, personnel handbooks, and manuals)	✓		✓	✓	
48.5.2 Discuss how specific organizational policies and rules influence a specific work situation	✓		✓	✓	
48.5.3 Explain the importance of self-discipline, positive attitude and integrity in a work situation (e.g., attendance, personal appearance, etc.)	✓		✓	✓	
48.5.4 Explain the importance of flexibility and willingness to learn new skills and knowledge	✓		✓	✓	
48.5.5 Identify responsibility to clients(s) and employer(s)	✓		✓	✓	
48.5.6 Explain importance of conflict resolution in the workplace	✓		✓	✓	

Content Standard 48.6: Students explain the importance of health and safety standards and concepts in the IT workplace

BIL: Essential – ISS, NS, PSD, IM
RC:

EDU:	10	12	AD
ISS	I	R	P
NS		P	R
PSD		I	P
IM	I	P	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
48.6.1 Explain the relationship between health, safety and productivity	✓		✓	✓	
48.6.2 Identify sources of safety information (e.g., company procedural manuals, documentation, standards, flowcharts, etc.)	✓		✓	✓	
48.6.3 Explain the importance of maintaining a safe work area	✓		✓	✓	
48.6.4 Explain how ergonomics and repetitive strain injury impact IT professionals	✓		✓	✓	
48.6.5 Exhibit behavior that meets established safety guidelines	✓		✓	✓	

Unit 49: Basic Business Concepts

Content Standard 49.1: Students evaluate types of business ownership

BIL: Essential – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	R
NS		I	R
PSD		I	R
IM		I	R

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
49.1.1 Define types of business ownership (e.g. sole proprietorship, partnership)	✓			✓	
49.1.2 Discuss the advantages and disadvantages of the different forms of business ownership	✓			✓	

Content Standard 49.2: Students analyze basic business organization and structure

BIL: Essential – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
49.2.1 Explain divisional and departmental structures (e.g., customer, geographic and product, etc.)	✓			✓	
49.2.2 Explain types of organizational structures (e.g., organic, matrix, mechanistic)	✓			✓	
49.2.3 Explain how internal and external forces impact the requirements for tech or service implementation (e.g., size, complexity, profitability)	✓			✓	

Content Standard 49.3: Students analyze the role of IT in meeting business strategic objectives

BIL: Essential – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
49.3.1 Define typical business objectives	✓			✓	
49.3.2 Discuss how IT functions impact business objectives	✓			✓	
49.3.3 Discuss obstacles in measuring the impact of IT functions on business objectives	✓			✓	
49.3.4 Explain the role of IT in the business organization	✓			✓	

Content Standard 49.4: Students evaluate factors affecting business risk

BIL: Essential – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS		I	P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
49.4.1 Discuss types of business risks	✓			✓	
49.4.2 Discuss ways to minimize business risks	✓			✓	
49.4.3 Identify factors affecting a businesses profit	✓			✓	

Content Standard 49.5: Students demonstrate basic accounting concepts

BIL: Essential – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS			I
NS			I
PSD		I	R
IM			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
49.5.1 Define accounting and explain the purpose of the accounting system	✓			✓	
49.5.2 Explain basic accounting principles and applications	✓			✓	
49.5.3 Identify appropriate accounting concepts and techniques for acquisition, depreciation, and disposal of property, plant, and equipment	✓			✓	

Content Standard 49.6: Students appraise knowledge of cost-benefit analysis

BIL: Essential – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS			P
NS		I	P
PSD		I	P
IM		I	P

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
49.6.1 Define cost and benefit analyses	✓			✓	
49.6.2 Differentiate between nonrecurring costs and recurring costs	✓			✓	
49.6.3 Identify major cost categories (e.g., hardware, software, communication services, training, interface conversion, etc.)	✓			✓	
49.6.4 Differentiate between tangible benefits and intangible benefits	✓			✓	
49.6.5 Explain why intangible benefits are included in analyses	✓			✓	
49.6.6 Identify tools used to rank and compare alternative costs and benefits (e.g., Net Present Value, Return on Investment, Discounted Payback Period)	✓			✓	
49.6.7 Execute full cost-benefit analysis	✓			✓	

Content Standard 49.7: Students analyze the vendor management process

BIL: Essential – ISS, NS, IM **Recommended** - PSD
RC:

EDU:	10	12	AD
ISS			I
NS			I
PSD			I
IM			I

Performance Expectations:	***ISS***	***NS***	***PSD***	***IM***	***Core***
49.7.1 Define components of a RFP (Request for Proposals) (e.g., transmittal letter, instructions and procedures, and requirements and specifications)	✓			✓	
49.7.2 Identify basic criteria for vendor selection	✓			✓	
49.7.3 Identify common forms of vendor-buyer agreements	✓			✓	
49.7.4 Identify common problems in the vendor management process in the IT environment (e.g., compliance, confidentiality and non-disclosure, etc.)	✓			✓	